

**Determinants of Indigenous Student Learning with Digital Technology:
A Qualitative Study in a Remote Manitoba First Nations Community**

by

Ben Akoh

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Faculty of Education
University of Manitoba
Winnipeg, Canada

Abstract

The goal of this qualitative study was to identify the determinants that assist remote post-secondary Indigenous Canadian learners (in an isolated fly-in only community) to adapt and orient themselves both to Eurocentric and Indigenous ways of learning. Digital technology such as mobile devices was used to produce documentation that served as the data for the research. The outcomes of the study led to the identification of a finite quantity of determinants. This is only a first step towards such identification, which provides a base for further research. Eight participants were directly involved in the study and six other participants provided contextual information. Participants showed a deep understanding of the problem: they were well meaning, eager and responsive to the study. The complexity of participant responses indicated that rethinking learning and understanding the place of Indigenous methods in education were needed. Rethinking solutions may require the direct participation of various stakeholders including educators and Indigenous communities. The solutions cannot be simply more technology or more pedagogy, although a careful reconsideration of pedagogy is required. Future research is key, but those research efforts must enter the community with a truly open mind and with culturally appropriate approaches without any pre-fixed solutions.

Keywords: digital technology, Aboriginal, Manitoba, pedagogy, adult learning.

Dedication

For

Karen, Veda, Jediel, Zuriel.

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Table of Contents

Abstract.....	1
Dedication.....	3
Acknowledgement.....	4
Table of Contents.....	6
List of Tables.....	10
List of Figures.....	11
List of Abbreviations.....	12
CHAPTER 1: INTRODUCTION.....	14
1.1 Research Overview.....	14
1.2 Research Context.....	28
1.3 Research Participants.....	37
1.4 Research Question.....	38
1.5 Definition of Terms.....	38
1.6 Legal and Policy Imperatives.....	43
1.7 Research Purpose.....	47
1.8 Conceptual Framework – Virtual Reality Frameworks and Cognitive Movements.....	48
1.9 Research Limitations and Delimitations.....	60
1.9.1 Insider/Outsider Dilemma.....	63
1.9.2 Insider/Outsider Research: Situating Self in the Research Context.....	63

1.9.3	Access Policies	64
1.9.4	Clarifying the Insider Outsider Dilemma	65
1.9.5	Philosophizing “the other” from an African Perspective	66
1.9.6	Geographic and Contextual Limitations.....	72
1.9.7	Limitations on Consideration of Cognitive Shift	73
1.9.8	Chapter Summary	75
CHAPTER 2: LITERATURE REVIEW		78
2.1	Global Post-secondary Trends.....	78
2.2	Post-Secondary Trends in Canada	82
2.3	Trends in Indigenous Post-Secondary Education	84
2.4	The Residential School System	89
2.5	Creating an Indigenous Post-Secondary Institution	92
2.6	Digital Technologies in Post-Secondary Education	94
2.6.1	Digital Technology Definitions	96
2.6.2	Implications of Technology on Learning	98
2.6.3	Learning Technologies in the Canadian Post-Secondary Context	105
2.7	Cognitive Impacts in a Technological Ecology.....	106
2.8	Chapter Summary	109
CHAPTER 3: METHODOLOGY		112
3.1	Narrative Inquiry as a Methodology.....	112
3.2	Why Narrative Research.....	115

3.3	Narrative Approaches in Canadian Post-Secondary Education.....	116
3.4	Historical Development and Philosophical Underpinnings of Narrative Analysis	120
3.5	Research Objectives	123
3.6	Research Participants.....	124
3.7	Research Questions.....	125
3.8	Research Method	128
3.9	Data Validation and Integrity Check.....	131
3.10	Data Analysis.....	132
3.11	Chapter Summary	134
CHAPTER 4: DATA PRESENTATION, ANALYSIS AND DISCUSSION		135
4.1	The Research Context.....	136
4.2	Digital Technology Use in a Safe Frame.....	140
4.3	Theme 1: Disconnects: Technological, Community, Cultural and Pedagogical	143
4.4	Theme 2: Socio-Cultural Challenges to Digital Technology Implementation and its use for Education.....	158
4.5	Theme 3: Unintended Consequences	183
4.6	Theme 4: Affordances	188
4.7	Chapter Summary	204
CHAPTER 5: CONCLUSIONS AND RECOMMENDATION		211
5.1	Cognitive Movements for Adaptation and Orientation	211

5.2	Beyond Basic Telecommunication	219
5.2.1	The Case for Better Infrastructure in Rural Manitoba	222
5.3	Techno-Culture Adaptive Framework (TAF).....	228
5.3.1	Contextual Variables	231
5.3.2	Determinants.....	237
5.4	Impacts.....	256
5.5	Further Research Questions.....	271
5.6	Summary.....	273
5.7	Concluding Thoughts.....	276
	References.....	282

List of Tables

Table 1: Framework for evaluation of virtual training	54
Table 2: Proportion of Aboriginal People by Selected Levels of Educational Attainment, Sex and Age Groups, Canada 2011	89
Table 3: Eligibility Criteria.....	125
Table 4: Sample of Participants' Interview Questions, Schedule and Activity	126
Table 5: List of research activities	129
Table 6: Participants' Community-Centric Interview Questions	130
Table 7: Data Analysis Categorization	132
Table 8: Determinants of learning in Indigenous communities.....	210

List of Figures

Figure 1: Research location in Northern Manitoba.....	33
Figure 2: The Techno-Culture Adaptive Framework	53
Figure 3: Phenomenological field of metaphorical mapping.....	57
Figure 4: Mobile Technology Mediated Adaptive Orienteering Framework.....	59
Figure 5: The Techno-Culture Adaptive Framework	230

List of Abbreviations

AMC – Assembly of Manitoba Chiefs

AUCC – Association of Canadian Universities and Colleges

CDMA – Code Division Multiple Access

CFS – Canadian Federation of Students

CHERD – Center for Higher Education Research and Development

COHERE – Canadian Collaboration for Online Higher Education and Research

CPE – Council of Post-secondary Education

CRTC – Canadian Radio-Television and Telecommunication Commission

BCN – Bunibonibee Cree Nation

ENREB – Education and Nursing Research Ethics Board

EULA – End-user License Agreement

FNIGC – First Nations Information Governance Center

GED – General Educational Development

HSPA – High Speed Packet Access

HSRDC – Human Resources and Skills Development Canada

ICM – Idealized Cognitive Model

ICT – Information and Communications Technology

ICT4D – Information and Communication Technology for Development

INAC – Indian and Northern Affairs Canada

iTK – Integrated Knowledge Translation

KCC – Keewatin Community College

LAN – Local Area Network

LTE – Long Term Evolution

MKO – Manitoba Keewatinook Ininew Okimowin

MOOCs – Massive Open Online Courses

MTMAOF – Mobile Technology Mediated Adaptive Orienteering Framework

MTS – Manitoba Telecommunication Service

OCAP – Ownership, Control, Access and Possession

OECD – Organization for Economic Cooperation and Development

RCMP – Royal Canadian Mounted Police

RICTA – Research on ICT with Aboriginal Communities

STATSCAN – Statistics Canada

TAF – Techno-Culture Adaptive Framework

TCPS – Tri-Council Policy Statement on Ethical Conduct of Research Involving Humans

TRC – Truth and Reconciliation Commission

TVTA – Technical and Vocational Training Assistance Act

UCN – University College of the North

UCN-REB – University College of the North Research Ethics Board

UN – United Nations

UNESCO - United Nations Educational, Scientific and Cultural Organization

UNPEC – University North Program Executive Committee

CHAPTER 1: INTRODUCTION

1.1 Research Overview

The goal of this qualitative study was to identify the determinants that assist a sample of post-secondary Indigenous learners (in an isolated fly-in only community) in Manitoba, Canada to adapt and orient between Eurocentric and Indigenous cultural ways of learning. Digital technology was used in the study as a tool for producing documentation. By understanding how this group of Indigenous students negotiated this process, educators may develop an understanding of learning methods that could produce gains to Indigenous students. Further, educators and others involved in providing learning in Indigenous communities might be able to understand the role of digital technology in facilitating learning in this type of context.

The study was conducted using an ethnographic approach involving fourteen participants some of whom were located in Oxford House (henceforth referred by its Indigenous name of Bunibonibee Cree Nation); an Indigenous First Nations community located 940 kms north of Winnipeg in Manitoba, Canada. At the time of the research, this community was accessible only via winter roads or scheduled flights. The study was conducted during the winter and spring months of 2016.

The World Health Organization defines social determinants of health as “conditions in which people are born, grow, live, work and age” (WHO, 2015). Determinants, as used in this study, describe factors/conditions that when present can produce expected outcomes or unexpected consequences with long-term impact on a people and on their community. Research in examining the notion of determinants as an important concept is captured in studies such as those conducted by Mignone & O’Neil (2005) and by Mignone, Elias, & Hall (2011) in which they described social capital as an important determinant in the health of First Nations people. Social

capital as a determinant of health has both individual and ecological characteristics. Individual characteristics may consist of education, income or gender. Ecological characteristics may consist of the level of crime, level of pollution or the willingness for community members to help themselves. These authors expect that “the more social capital there is in a community, the better that community is for everyone’s health” (Mignone & O’Neil, 2005, p. S51). Other studies also describe information and communications technologies as an important determinant of the social capital of First Nations communities (Mignone & Henley, 2009a).

The notion of determinants for societal benefit emanated from the public health sector. Irwin, Solar, & Vega (2008, p. 64) describe the observation of public health scientists in the 1940s as follows:

Social conditions decisively influence health. The sanitary campaigns of the nineteenth century and the work of the founders of modern public health reflected awareness of the relationship between people’s social position, their living conditions, and their health outcomes.

Since the 1940s there have been numerous agendas that tend to link social determinants to health. For instance, the 1948 World Health Organization’s constitution recognized the notion of social determinants of health. The organization has consistently linked educational development, employment conditions and social exclusion to social determinants of health. Its most recent elaboration of social determinants include (WHO, 2013):

1. Employment conditions: Measures to clarify how different types of jobs and the threat of unemployment affect workers’ health.
2. Social exclusion: The relational processes that lead to the exclusion of particular groups of people from engaging fully in community and social life.

3. Priority public health conditions: Factors in the design and implementation of programs that increases access to health care for socially and economically disadvantaged groups.
4. Women and gender equity: Mechanisms, processes and actions that can be taken to reduce gender-based inequities in health by examining different areas.
5. Early child development: Well established evidence illustrates that opportunities provided to young children are crucial in shaping lifelong health and development status.
6. Globalization: How globalization's dynamics and processes affect health outcomes: trade liberalization, integration of production of goods.
7. Health systems: Innovative approaches that effectively incorporate action on social determinants of health.
8. Measurement and evidence: The development of methodologies and tools for measuring the causes, pathways and health outcomes of policy interventions.
9. Urbanization: Broad policy interventions related to healthy urbanization, including close examination of slum upgrading.

Social determinants of health are also often related to social justice agendas as they aim to reduce inequities between social strata in society. Hardon described five determinants (Hardon, 2013, p. 1208):

1. Biological factors such as gender, race, ethnicity and genetic predisposition.
2. Individual behaviours that contribute to overall quality of life such as illicit drug use or sedentary and high stress lifestyles that could increase the chances of chronic diseases and negatively impact health outcomes.

3. The social environment related to the conditions in which a person is born such as social norms, socio-economic status, employability status, economic privilege, racism, sexism and prejudice.
4. The built environment, which includes the location, type and quality of housing; the presence of crime and violence; and the physical quality of the environment.
5. Health services which includes accessibility and quality of health services, cultural competency in health care, and the ability to afford and to travel to receive health services.

Access to technology and using technology to access knowledge have also been framed as social determinants in much the same way as access to health care, in and of itself, is framed as a social determinant of health.

The presence and effective uses of digital technology to access information and to access knowledge could result in increased understanding about many human development issues including health-related information. Having access to knowledge helps to contribute to improving the quality of life and helps in minimizing risks to life and health.

Using digital technology does not always produce positive gains. In fact, its impact could also undermine certain aspects of social determinants of health. International institutions such as the World Health Organization and other global health actors that have “emphasized technology-driven, vertical campaigns targeting diseases” seemed to have carried out this mandate with little regard for the social context in which people live (Irwin et al., 2008, p. 64).

Studies of community informatics like Clement (2011) on a model for First Nations broadband networks, Fisher, Clement & Walmark (2006) and Thiessen & Looker (2008) on the concept of cultural centrality and information and communications technologies among First

Nations communities tend to bridge the connection between the local social context and technology by focusing on narrowing the “digital divide”. They do so by exploring the utility and the various applications of information and communications technologies in Indigenous communities. Some of the utility of technology may not necessarily improve the social and economic well being of individuals in the Indigenous communities. For instance, certain community-based projects might have been undertaken by so called “experts” who purportedly conducted them for the benefit of the target community from their expert perspective but who might not often have involved community stakeholder perspectives of the would be beneficiaries of the projects.

The study described in this thesis is a contribution to the growing body of knowledge on the phenomenon of learning with digital technology in Indigenous communities. The study design was careful to involve a specific group of community members as active study participants and not simply as informants of a research project. As participants they controlled the research variables and they contributed in shaping its outcomes. They utilized digital technologies in their own context and they sought after benefits that could accrue to their individual work, career and to their community as a whole. As a result participants exhibited characteristics such as feelings of ownership, sense of self and sense of identity upon completing the study’s activities.

In examining the determinants that assist a sample of post-secondary Indigenous learners in Bunibonibee Cree Nation to adapt and orient between Indigenous and Eurocentric learning domains, a framework was produced that could be used as a tool to assist school administrators, educators and students to:

- a) Recognize the existence of different worldviews in their learning context.

- b) Collaborate better where adaptations and negotiations between these worldviews are needed.
- c) Explore the role of digital technology for facilitating adaptations and negotiations between worldviews.

Digital technology was used to produce documentation for how this group of learners adapted and oriented themselves between the two learning domains. However, this was not without significant challenges such as the existence of a digital divide between this community and those communities in large urban areas like in Winnipeg, Manitoba.

A common misconception about digital technology, especially in its use for development, tends to suggest that technology, in and of itself could narrow “digital divides” (Geldof, Grimshaw, Kleine, & Unwin, 2011). Yet some others tend to think that the positive outcomes associated with technology use in one context would produce similar outcomes in another (Walsham, 2017). Digital technology and its applications are not often context-independent. Some digital technology may be incompatible with some contexts.

The notion of “digital divide” is often described as a metaphor that characterized technology as a bridge between two “geographically” polarized locations merely from a technological vantage point. However, the notion encompasses more than physical location. Socio-economic, environmental and political factors are often at play to create differences between contexts in a digital divide. This metaphorical representation also carries the assumption that technology creates a “level playing field” between the divides so that the economic “haves” and “have-nots” across the divide would be able to interact and through this interaction attain similar benefits. This assumption is often misleading. Technology does not always bridge geographically dispersed locations. Neither does it always equalize economical and socially

different contexts. Sometimes technology further disenfranchises, creates divisions and produces less than its well-intentioned outcomes (Wood, 2015).

Since the mid-eighties international development organizations have attempted to address the digital divide through implementations of technology for poverty alleviation projects. These projects were often described as Information and Technology for Development (ICTD or ICT4D) and they were implemented in Indigenous communities in many developing countries around the world (Hofman, Aravena, & Aliaga, 2016; Kordha Tolica, Sevrani, & Gorica, 2015; Laouris & Laouri, 2008; Walsham, 2017). But some of these projects failed and many did not meet their expected poverty reduction expectations. International development organizations such as the World Bank and the International Finance Corporation began to ask serious fundamental methodology questions about why these technology projects failed (Laouris & Laouri, 2008). Similarly, academics have reflected and continue to reflect, take stock and ask similar questions (Walsham, 2017).

There are probable truths that technology can improve societies. In other Indigenous contexts such as in Africa, notably Kenya, Nigeria and South Africa, some projects have arguably leapfrogged Indigenous communities into the digital age (Brown, 2003). Leapfrogging, another metaphor, is often used to describe technology advancements from a place of less technology to more technology without necessarily passing through the traditional challenges and hurdle others may have experienced (Ünver, 2017; Wageche & Chi, 2017). Communities that leapfrog avoid the failures experienced by others. They arrive directly at the benefits. Leapfrogging describes accelerated development towards financial and economic stability in societies where these may have been inexistent (Akoh et al., 2012; Mata & Pont, 2016).

Young entrepreneurs and innovators in these Indigenous societies have used technology-based projects to create accelerated developments experiences. These projects have led to various degrees of success including the financial inclusion of the rural poor. For instance, mobile money applications have improved access to finances for the unbanked in Kenya, Uganda and Tanzania's Indigenous communities (Diamond & Roberts, 2012; Medhi, Ratan, & Toyama, 2009; Ndemo & Weiss, 2017). Farmers in Senegal and in northern Nigeria have used technology to predict the outcomes of fish and grain prices and to adjust their harvest accordingly (Akoh et al., 2012). Several other Indigenous communities in countries such as Ghana, Liberia and Sierra Leone have used technology such as mobile phones to engage with government officials and to participate in democratic processes (Akoh & Ahiabenu, 2012; Flyverbom, Madsen, & Rasche, 2017; Hanna, 2016). Exemplars in these countries make the point that Indigenous experiences and issues are equally as significant as national experiences and issues, if not more.

Whereas these projects have somewhat contributed to improving certain economic, social, and cultural aspects of the target communities, some other projects have produced unintended consequences – some of which have been negative. The outcomes of unsuccessful projects have resulted in a loss of faith and distrust among implementers and target communities. Technology projects should therefore be carefully evaluated, planned and discussed with community members before they are implemented. A consultative approach could help to avoid the costly mistakes associated with the implementations of the past that could consequently result in cost savings (Zervas, Chatzistavrianos, & Sampson, 2014).

Most, if not all technology projects require careful planning. Careful planning is intrinsically important for a project to succeed. Some projects require planning that involves an understanding of the project environment. Planning that is careful is likely to produce direct

outcomes and the specific impacts a project could have on the target environment (Heeks, 2010). More thoughtful approaches such as scenario planning exercises could help project designers and implementers to picture options that could produce more successful and less risky project outcomes. However, such exercises are costly because they entail many consultations and often require large scale development of pilot projects (Akoh, 2012a). Not many countries or communities can afford such implementations. Indigenous communities in Canada for instance may be unable to make large investments given the scarcity of resources. Their unique geographic locations also pose significant challenges. The above challenges prevent this type of experimentation with technology but they also present an interesting opportunity for educational technology innovation and practice in Canadian Indigenous schools.

Because each community is unique, educational technology projects should be devoid of conjectural implementations that have no regard for differences in contexts and culture. Broad assumptions that lead to brush-stroke implementations may not be feasible across the various communities of the province (Looker & Thiessen, 2003a; McMahon, O'Donnell, Smith, Woodman Simmonds, & Walmark, 2010). The uniqueness of each community and their specific educational and technological needs should be considered exclusively.

Another obvious assumption that characterized many ICT4D projects implemented in Indigenous communities in developing countries suggested that the cognitive requirements of the project participants to use, negotiate and adapt to technology are often similar irrespective of their learning context (Geldof et al., 2011; Heeks, 2010). Despite the obvious potential for failure in some of these projects, international development organizations went ahead to implement them, perhaps in the hope that contextual realities would eventually align with the development expectations of the projects. As a result these projects failed most probably because they ignored

the contextual specificities and likely because project participants were unable to connect the projects to their lived realities (Geldof et al., 2011; Heeks, 2010). This approach was not sufficient for addressing the development needs of the contexts in which they were implemented. Neither should it be sufficient for addressing the educational technology needs of Indigenous peoples in Canada and in other contexts. More so that digital technology such as smart phones, application systems and hardware infrastructure are always evolving and their applications are ever so dynamic. School curricula and pedagogical approaches, which are often time-bound, may not keep up with the rapid pace of the evolution of digital technology. Similarly project contexts are different and they often give rise to differences in ways of learning and knowing. The application of educational technology in one context may not be relevant to another. Given these various uncertainties, what should educators, administrators and policy makers who implement educational technology projects do?

Understanding the socio-historic contexts and ways of learning may be a start since there are different learning needs between Indigenous and Eurocentric cultures in Canada that the school systems have only recently come to recognize (UWinnipeg, 2017). This dynamic presents another layer of complexity for educators, administrators and policy makers who provide education using educational technologies to learners in Indigenous communities. In the least, they should ensure that technology implementations in these communities broadly and digital education technology implementation in their schools specifically are undertaken carefully and that systematic and methodical approaches are utilized in these implementations. Of significant importance is the need to consider the contextual reality, the culture and the ways of learning of the Indigenous community in which educational technology projects are targeted.

In contrast to approaches that do not recognize Indigenous context, studies undertaken by Michell, Vizina, Augustus, & Sawyer (2008), Aikenhead (1997) and Ezeife (2003) have utilized approaches that suggests the need for negotiations between Indigenous methods and Eurocentric ones. Their projects were founded on Indigenous principles, cultural methods, social capital, and pedagogy. They argue that an understanding of Indigenous learning principles could provide the necessary scaffolding on which negotiations with Eurocentric methods can be established.

For instance, Michell et al. (2008) suggested that “education cannot be separated from the larger social and cultural matrix from which it is defined...spanning the four stages of the life cycle – child, youth, adult and elder...[Learning is holistic, connecting with the learner at the] intellectual, spiritual, emotional and physical levels (2008, pp. 18–20). Accordingly,

Indigenous pedagogies [should include] ways of transmitting knowledge through language and other symbolic means while respecting other cultures, perspectives and realms of being...Much of [Indigenous] education occurred within the context of the natural social setting. Although complex, Indigenous knowledge systems were not regimented or institutionalized in a formal way as they are now [...] Learning specific skills occurred within the context of doing, practicing, and participating in everyday life activities, and instruction was received implicitly or by repeated example and demonstration. Traditional Indigenous education reflected and encompassed cultural values, epistemologies, and social systems: it is [...], ‘a total way of life’ (Michell et al., 2008, p. 16).

According to Michell et al. (2008, p. 30), it is difficult to understand Indigenous perspectives using Eurocentric lens because “Indigenous knowledge does not fit the Eurocentric concept of culture, it is not a uniform concept among all Indigenous peoples and it cannot be separated from its bearer or codified into a definition.” Learning in this context came from playing

games and story telling, which produced “moral lessons, values, and lessons from the natural world” (p. 16).

This notion of contextual learning in Indigenous cultures resulted from cultural transmissions of knowledge through approaches such as story telling. This approach is consistent with Kovach's (2010, p. 40) description of Indigenous knowledge transmission which she described as comprising of “a specific way of knowing based upon oral tradition of sharing knowledge...identif[ied] as storytelling, yarnning, talk story, re-storying, re-memembering”. Kovach built on this concept by calling it “conversational methods”. She went further to suggest that it is a research methodology (Kovach, 2010a) and a conceptual framework for conducting Indigenous research (Kovach, 2010b). Her approach was consistent with Indigenous theory and methods of practice described by Wilson (2008) in his book “Research is Ceremony: Indigenous Research Methods”.

Atleo's (2001) presentation of the 4Rs and 4Ds of storywork is another analytical framework for examining Indigenous narratives:

The 4 Rs, Reverence, Respect, Responsibility, and Relations provided the structure for the development of protocols. The 4 Ds provided the [four] *dynamics* - wholism, inter-relatedness, reciprocity and synergy. Together they provide the means to both observe the background and foreground when examining the narratives by shifting between them to observe both the structures and the processes. These principles are operationalized in a perspective of Hishuk-ish-ts 'awalk - Everything is one through a process of metaphorical mapping and phenomenological orienteering. The 4 Rs and 4 Ds would suggest that there are social system structures and dynamics that may be generalizable as principles but

which become articulated particularly in the process of research at more concrete levels of analysis (Atleo, 2001, p. 109).

Here, Atleo used the 4Rs and 4Ds as lenses to observe narratives between multiple domains in a specific learning context.

These aforementioned Indigenous methods of learning purportedly existed before European settlement in Canada. They provided frameworks that could act as a base from which negotiations between Indigenous knowledge systems and their Eurocentric equivalent could take place. Historically, these negotiations did not occur. The residential school system for instance fragmented the “intergenerational transmission of Indigenous worldviews and knowledge system” (Mitchell, 2012, p. 17). Since then, communities have been seeking to re-establish and resume control “over their education...and [to establish] effective partnerships with existing school systems through meaningful involvement and consultation” (Mitchell, 2012, p. 17). While the introduction of digital technology into this mix could present an affordance of facilitating dialogue and negotiations, its introduction could make negotiations even more complex. Most educational technology are inherently biased towards Eurocentric cultures, as will be discussed later; such biases are different from the cultures of the Indigenous communities in which the educational technology will be implemented.

Our modern day reality of communication, knowledge transfer, knowledge formation, learning and education is significantly influenced by digital technology such as the internet and mobile telephones. They influence how we learn, work, and play. By exploring the potential of digital technology for reinforcing and fostering connections between people we may be able to better understand and address some challenges of learning among Indigenous learners in their communities. Studies that explore the use of digital technology for learning in Indigenous

contexts could suggest solutions to Indigenous learning challenges that result in high attrition rates among learners (Desroches, 2006; Kanu, 2005; Kirkness, 1999). With such research, light might also be shed on other socio-cultural challenges (Neeganagwedgin, 2013; Tang & Browne, 2008; Wotherspoon & Schissel, 1988) and educational problems that may have resulted from learning methods engendered by the co-existence of Indigenous and Eurocentric learning concepts.

Having had experiences in other Indigenous cultural contexts where technology had been implemented, I was careful not to introduce “development” project concepts to this study. I also did not intend to merely promote the implementation of digital technology in Bunibonibee Cree Nation where this study was undertaken under the guise of development (Westhead, 2013a, 2013b). As a part of entering a “safe frame” (discussed later) between the research communities, individuals and I, I promised not to apply digital technology as the silver bullet for the educational emancipation of the study community. Rather, I embarked on a journey that would objectively examine determinants that could foster adaptation and orientation for learners in a context in which Indigenous and Eurocentric learning domains were present. By taking this position, I entered the research context with an open mind and ensured that the implementation of the study activities was a departure from the failed practices of the ICT4D era that were implemented in various Indigenous African communities in which I had experiences as either a collaborator or a participant (Geldof et al., 2011). I have since recognized that the ultimate promise of development conveyed by these “failed” projects (Kyem, 2012) was not attainable and that project success was subjectively defined by the individuals who were involved in the study themselves and their community. They themselves decided if the project was beneficial to them or not.

As a participant in many development projects in Indigenous African communities, I recognized the role that digital technology played in leapfrogging many other communities

towards development. I experienced both the positive affordances and negative unintended consequences of digital technology on social interactions among Indigenous community members and policy makers. Digital technology had either improved or severed communication between members who lived in community and those who lived outside it. Digital technologies had also presented opportunities for Indigenous people to explore economic growth initiatives and to improve learning (Simon, Burton, Lockhart, & O'Donnell, 2014).

To avoid the past mistakes associated with development projects among Indigenous communities, this study was intended to benefit educators and researchers in the framing of Indigenous culture-centric pedagogy that would respect and respond to the core needs of Indigenous learners. Its outcome could also assist educational administrators, policy and decision makers to develop the right supports and infrastructural needs that could produce effective learning in Indigenous communities.

This chapter presents an overview of the study. It describes the research context, participants, purpose, method and methodology, and the research question. It presents the legal and policy documents that provided an imperative for the study. An emergent framework is briefly presented in this chapter but discussed in more details in chapter 5. The Techno-Culture Adaptive Framework may be useful for examining the concept of orientation and adaptation between multiple domains in Indigenous learning contexts. The chapter also describes the limitations and delimitations of the study.

1.2 Research Context

The research was conducted in Bunibonibee Cree Nation, which is a rural fly-in, Indigenous First Nations community located 940 kms north of Winnipeg, Manitoba, Canada. The community is also serviced by winter roads. This research location was selected because it was

remotely located and accessible by airplane and winter ice roads. It had a unique information and communications technology challenge because of its antiquated telecommunication network. Bunibonibee Cree Nation mobile telephone network was only recently upgraded in April 2016 to allow data and voice traffic, making it one of the last Indigenous communities in Manitoba to benefit from a reasonably modern telecommunications infrastructure upgrade.

Bunibonibee Cree Nation has a population of about 2000 inhabitants. It has a medevac center, an airport and a nursing station for the sickly and elderly. A local education board administers its primary and secondary education and local council of elected chiefs and elders provide overall governance. There is one convenience store situated on one of the major streets in the community. Most of the goods sold in this store are delivered into the community by airplane resulting in heavily marked up prices for the goods. Packaged goods and fresh produce are expensive.

Bunibonibee Cree Nation has an elementary school constructed in 1975, a high school constructed in the late 1990s and a learning center that was set up by the University College of the North in the last decade. The University College of the North (described later) was set up to coordinate learning of Indigenous people in communities spread across northern Manitoba. The University College of the North center in Bunibonibee Cree Nation and those in other northern communities provide adult learning courses to students who are enrolled in post-secondary programs at the university.

At the time of the study, only eight students were frequently attending classes in which they had been enrolled for nearly five years. More than half of the students initially enrolled in the program had dropped out. The eight current students became participants of the research after meeting the recruitment criteria and completing the ethics requirement. Another set of

approximately 20 students who had completed high school were taking preparatory classes towards admission in a Canadian university. Although they were not officially enrolled in a University College of the North program, instructors of the University College provided preparatory classes to them at the center. These students were not recruited to be participants of the research project because they were not officially enrolled.

One instructor was permanently resident in the community and others were flown in to teach specific courses at different times. The center had a resident coordinator who was responsible for both administrative and technology functions.

Bunibonibee Cree Nation has always been a forward-looking Indigenous First Nations that prides itself in staying in stride with provincial and national developments in popular culture (Cohen, 2009), women leadership (CPIQ, 2015), renewable energy (CCN, 2002) and in education (Narine, 2015). These factors informed the choice of Bunibonibee Cree Nation as a community location where the greatest research gain can be attained and where the most value can accrue to its community members.

Bunibonibee Cree Nation was officially recognized as a community in 1798 (OHFN, 1998). It has a history of being a thriving economic hub for the fur trade since the late 1780s. It was a supply depot for the Hudson's Bay Company (Hanks, 1982). It is located on a rich land inhabited by hunters, fishers and trappers prior to European settlement. Bunibonibee Cree Nation is close to the Hayes River system, which was used as a transit route to Nelson House making it a very important economic hub. When the community was established, during the early fur trade, the local Cree and Europeans operated as equal trading partners (Hanks, 1982).

This mutually beneficial relationship eventually became skewed in favour of the settler Europeans. The credit arrangement system that was later introduced by the Europeans created

divisions among the previously unified Cree communities. As resources dwindled (raw fur and big game) dependence shifted to the Europeans. The Cree resorted to work for the Hudson's Bay Company for very minimal wages. This arrangement led to the systematic fleecing by Europeans of resources that the Cree once owned and respectfully used. Hanks' (1982) report speaks of economic and political subjugation to the extent that the Cree could have pursued their traditional livelihoods successfully if their land had not been stripped of its rich raw fur and big game (1982, p. 107).

The Cree were shortchanged in education. In the absence of appropriate local schools, families sent their young children to Winnipeg, Dauphin and Brandon to attend residential schools. An account in the June 26, 1972 edition of the *Prince George Citizen* reported of a plane crash in the St. James area of Winnipeg that killed 7 young Bunibonibee Cree Nation residents aged from 16 to 21, the pilot and a passenger from Norway House (PGC, 1972). Parents refused to send their children to school after this mishap. Attempts to build a high school in close proximity to the community were unsuccessful until the later half of the 90s when the 1972 Memorial High School was constructed and named in remembrance of the plane crash. In 2016, approximately 300 students are enrolled in the school annually (MFNERC, 2016).

The University College of the North was created to address the educational needs of the northern population. Its creation was not without challenges. It took nearly two decades of discussions and negotiations before the Province of Manitoba's "University College of the North Act C.C.S.M. c. U55 (henceforth referred to as the 'Act')" was enacted to create the university. Discussions about its creation started with an Indian Education General Assembly held in Nelson House in 1987 from which a committee was initiated to commence work on a Northern University. Two years later, Manitoba Keewatinook Ininew Okimowin (MKO) a non-profit

political advocacy organization that provided a collective voice on issues of treaty and aboriginal and human rights for the citizens of the 30 sovereign First Nations passed a series of resolutions calling for the establishment of the university. Following a report by the University Education Review Commission in 1993, Keewatin Community College was required to redefine its mandate to offer university degree programs.

In 1999 twelve years after the General Assembly, the Province of Manitoba, the Council of Post-Secondary Education (CPE) and the Keewatin Community College (KCC) established a committee to advance discussions for the creation of the university. Their work was to identify issues related to the establishment of a University College of the North. Members of the committee included representatives from Manitoba First Nations, Manitoba Metis Federation, municipal governments, Manitoba Universities, Keewatin Community College, area school divisions, and federal and provincial government departments.

The committee's report, "University College of the North: A Vision for Our Future" was submitted to Premier Doer of Manitoba in September 2000. Two years later, further consultations were held from September to December 2002 with various constituents across the geographic north. These consultations involved many stakeholders including community members, academic institutions, crown corporations and industry. Dr. Verna Kirkness was commissioned to lead the process across all of Manitoba by the then Manitoba Minister of Manitoba Advanced Education and Training, Diane McGifford. The Minister "was struck by the fact that the debate over post-secondary services in northern Manitoba has been going on for almost 15 years" and that neither the "lack of political will nor the challenge of serving a small population scattered over some 200,000 square miles" (Kirkness, 2003, p. 29) were sufficient reasons to prevent the set up of the University College of the North. She argued that it was unfair that this "small group of people

[who] has disproportionately contributed to our provincial well-being through their harvesting of the immense hydroelectric, forest and mineral wealth” could be deprived of a university or college “capable of transforming individuals and developing a vast region” (Kirkness, 2003, p. 29).

Figure 1: Research location in Northern Manitoba



Note. Reprinted from University College of the North website, 2017. Retrieved from <https://www.ucn.ca/sites/commservices/regionalcentres/Pages/Regional-Centres.aspx>

During September 2002, consultations were held with communities from Thompson, Tataskweyak (Split Lake), Shamattawa, South Indian Lake, Barren Lands/ Brochet, Lac Brochet, and Tadoule Lake. Consultations were held in October with the communities of St. Theresa Point, Garden Hill, Wasagamach, Red Sucker Lake, Bunibonibee Cree Nation, Pimicikamak (Cross Lake), God's River, God's Lake Narrows, The Pas, Flin Flon and Norway House (see Figure 1).

In late October and all of November 2002 consultations were held in Winnipeg with different interests groups such as the University North Program Executive Committee (UNPEC), Assembly of Manitoba Chiefs (AMC), Indian and Northern Affairs Canada (INAC) and the University of Manitoba northern staff and students. By December of that year northern staff and students of Brandon University, Frontier School Division, and representatives of Manitoba Hydro had also contributed to the report. The "University College of the North: Recommendations and Action Plan. Report of the Consultation on Post-Secondary Education in Northern Manitoba" (henceforth referred to as the 'Recommendation and Action Plan') report was released in March 2003 (Kirkness, 2003).

On May 3, 2003 an implementation committee was appointed to provide guidance and leadership in the planning and development of the University College of the North. The team was mandated to hold consultations with elders, to conduct focus groups and to establish a Northern Symposium. The consultation resulted in a unique structure that integrated elders into the governing structure of the university. Four consultations were held with elders, first in October 2003 to determine the level of their involvement with the university and in its formation. The second consultation was held in January 2004 to integrate their involvement and solicit their guidance. A draft governing structure that would include elders in the university administration

was discussed at the third consultation held in March 2004. The role of the Council of Elders, its position within the governing structure of the university, and the definition and guidelines for working with elders in a post-secondary education setting were discussed during the fourth consultation held on May 2004. Elders continue to play a role in shaping the university's direction and governance.

During the time of the third consultation, the University College of the North Bill 20 was tabled before the house on March 3, 2004. It was given assent on June 10, 2004 and the University College of the North Act came into force on July 1, 2004.

The University College of the North was meant to be an "institution that will provide an inclusive range of credible, accessible and attainable post-secondary education opportunities to Aboriginal and northern residents" (MKO, 2000, p. 8). It provided:

1. Education [that is] learner centered and designed to support student growth and developments.
2. Learning environment [that is] holistic and characterized by a culture of openness, inclusiveness, tolerance and respect.
3. Program curricula [that will] integrate a balance of traditional and culture and reflect the Aboriginal reality and cultural diversity of the north.
4. Content that is dedicated to community and northern economic, cultural and environmental development.
5. A location in the north regionally and within the communities, and open to adapting a broad range of innovative practices around program and content design and delivery (Kirkness, 2003; MKO, 2000).

In order to meet this mandate two main campuses were created in The Pas and Thompson and twelve regional centers were established in various Indigenous communities across northern Manitoba including Easterville (Chemawawin), Churchill, Cross Lake (Pimicikamak), Flin Flon, Grand Rapids (Misipawistik), Norway House, Nelson House (Nisichawayasihk), Bunibonibee Cree Nation, Split Lake (Tataskweyak), Pukatawagan (Mathias Colom), St. Theresa Point and Swan River.

The role of educational technology was integral in the plans for connecting the main campuses and the regional centers. Educational technology was identified as “the means [for] providing not only the widest possible range of programming but also the glue that can hold a far-flung operation together” (Kirkness, 2003, p. 17).

The university’s administration continues to believe in the use of educational technology to bridge the metaphorical digital divide mentioned earlier; whether in the past where it had established connectivity between its main campus and its remote regional centers or at the time of this study where it explored the use of smart boards and learning management systems for learning. The existence of a robust telecommunication infrastructure that allows voice and data services could be helpful in meeting these objectives.

Until April 2016 Bunibonibee Cree Nation operated on a Code Division Multiple Access (CDMA) mobile network (on a frequency band of 800-MHz and 1.9 GHz), which is among the first generation of mobile networks. This network in Bunibonibee Cree Nation only allowed mobile-to-mobile communication between residents of the community who had access to a CDMA enabled mobile device. During my visits to the community, I was unable to make calls from my LTE capable device to community members who had CDMA devices. I was also unable to make calls to people in Winnipeg from Bunibonibee Cree Nation because my device could not

connect to the CDMA network. The network did not support the transmission of high-speed data that was available in most urban areas where Long Term Evolution (LTE) capable networks were in operation.

LTE networks operational in Winnipeg allowed better quality data and voice transmissions. The difference between the mobile network standards in Bunibonibee Cree Nation and in Winnipeg prevented communication between users in both communities. After April 2016 the network in Bunibonibee Cree Nation was upgraded to a High Speed Packet Access (HSPA) network. Although this new network standard was better than the previous CDMA standard, because it was capable of transmitting voice and data, it was less robust than the LTE standard networks in operations in Winnipeg.

A suitable telecommunication infrastructure is required to meet the Government of Canada's Digital Canada 150 promise of at least 5 Mbps connection speed to 98% of Canadian households by 2017. It is essential for the University College of the North to meet its goal of reaching students spread across over 200,000 square miles of the North's very challenging geography.

1.3 Research Participants

A small sample of 14 participants was involved in the study. This sample was split into two groups. The primary participant group was made up of 8 participants. They consisted of those who reside in Bunibonibee Cree Nation, had self-identified as Indigenous, had successfully completed high school/General Educational Development (GED) program, were enrolled in a program offered by the University College of the North, were over the age of 18, were fluent in English, and were willing to actively participate in the study for the 3-month period of data collection.

The secondary research participant group was made up of six participants. They consisted of those who had intimate knowledge of Bunibonibee Cree Nation, who were fluent in English and who were either elders in the community, administrative or academic staff of the University College of the North, or implementers of digital technology.

Participants were recruited using a purposeful sampling that allowed the selection of “*information-rich* cases for study in depth” (Coyne, 1997; Patton, 1990; Suri, 2011). The recruitment and participation methods are described in Chapter 3.

1.4 Research Question

The study was designed to explore the main research question, “what are the determinants that assist post-secondary Indigenous learners in a rural Manitoba community to adapt and orient themselves between Eurocentric and Indigenous ways of learning?” Phenomenological studies support the use of sub-questions to further explore the main research question (Creswell, 2006; Moran, 2000). Sub-questions are described in the research methodology and method section in chapter 3.

1.5 Definition of Terms

Critical terms are used throughout this text that require definition. In some cases, words are used interchangeably. This section presents a summary definition of these critical terms and their usage in this text.

CDMA: CDMA is short for Code Division Multiple Access. It is a system for mobile phone access. As a multiple access system several users can share the same band of frequencies. CDMA operates on a frequency band of between 800 MHz and 1.9 GHz, which is lower than some of the more recent systems, which have higher frequency bands that allow more applications. Most CDMA enabled mobile devices are locked to their network providers. Subscribers are often

unable to switch from CDMA to the more progressive Global System for Mobile Communications or simply GSM networks because of locked devices. CDMA was the telecommunication system in operation in Bunibonibee Cree Nation prior to April 2016.

Determinants: The study is about learning orientation and adaptation between Eurocentric and Indigenous domains undertaken by Indigenous learners in a rural Manitoba learning context. Digital technology was used to produce documentation for learners' learning orientation and adaptation. The term determinants represent the existence of factors that influence the production of outcomes. Determinants for learning orientation and adaptation by Indigenous adult learners described in this thesis is used in the manner consistent with the World Health Organization's social determinants of health (Hardon, 2013; Irwin et al., 2008; WHO, 2015).

Digital Technology and Digital Artifact: Digital technology refers to devices such as tablets, iPads, mobile phones, computers, and iPods and any other portable devices capable of recording voice and video. While the term "digital technology" is used to broadly describe these devices participants in the study mostly utilized their personal smart mobile phones that were capable of video and voice recording and taking pictures. Digital artifacts are products resulting from the use of a digital technology. For instance, a voice file is a digital artifact created from the use of a voice recorder.

HSPA: High Speed Packet Access is a third generation mobile phone network that combines both high speed uplink and downlink to provide faster mobile communication. This network provides better data speeds allowing users to send and receive data much quicker than on earlier generations of mobile systems. As a system that operates in a higher frequency band, above 1900 MHz, it is often called a "broadband" system. Broadband systems permit the transmission of multiple signal and data types. This system is appropriate for the needs of the research location

but provides far less capacity and speed compared to other systems in operation in other urban locations in Manitoba.

Indigenous: The term Indigenous is a contested term. It has complex connotations that are nuanced depending on the cultural context that it is used. Indigenous could be used to define identity, language usage, areas of interest, geographic locations, etc., among many others. In response to the question of who is Indigenous, Corntassel (2003) surmises that only Indigenous people can answer. He settles on a broad definition of Indigenous as complex “interlocking concepts of sacred history, ceremonial cycles, language and ancestral homelands...[of] (Corntassel, 2003, pp. 91–92):”

1. Peoples who believe they are ancestrally related and identify themselves based on oral and/or written histories as descendants of the original inhabitants of their ancestral homelands.
2. Peoples who may but not necessarily have their own informal and/or formal political, economic and social institutions, which tend to be community-based and which reflect their distinct ceremonial cycles, kinship networks and continuously evolving cultural traditions.
3. Peoples who speak (or once spoke) an Indigenous language often different from the dominant society’s language – even where the Indigenous language is not ‘spoken’ distinct dialects and/or uniquely Indigenous expressions may persist as a form of Indigenous identity.
4. Peoples who distinguish themselves from the dominant society and/or other cultural groups while maintaining a close relationship with their ancestral homelands/sacred

sites, which may be threatened by ongoing military, economic or political encroachment.

A clear-cut definition of the term “Indigenous” is not simple. Defining someone as “a member of an indigenous group can be difficult because of for example the assimilation process, history of colonization, or complex legislation regulating membership in an indigenous people” (Sarivaara, Maatta, & Uusiautti, 2013, p. 369). At this point in time in Canada, the terms Indigenous and First Nations are preferred rather than Aboriginal or Indian. For context however, it is used here to represent persons and communities situated on a land who have developed and live by a local culture and who live within a local context. By extension and in a similar manner, I describe myself as “Indigenous” originating from the Idoma people of Nigeria. Specifically, the terms Indigenous and First Nations will always be capitalized when referring to Indigenous or First Nations all throughout this thesis.

Indigenous Culture-Based Reasoning: Indigenous culture-based reasoning referred in this text is a reflective process in which participants invoke histories, stories, cultures, traditions and practices as the basis for thinking and a way to support decision-making. A comparative Eurocentric process is called critical thinking. There are substantial differences between Indigenous culture-based reasoning and critical thinking. Critical thinking has many definitions. It is often described as “high-order thinking...that involves a process of thinking carefully about a subject or idea, without allowing feelings or opinions to affect you” (Wang & Huibin, 2016, p. 1323). Critical thinking entails the examination of “structures or elements of thought implicit in all reasoning...It is incorporated in a family of interwoven modes of thinking...scientific thinking, mathematical thinking, historical thinking, anthropological thinking, economic thinking, moral thinking and philosophical thinking” (Weissberg, 2013, p. 328). Advocates of critical thinking

“maintain that people should question ‘faulty arguments, hasty generalizations, assertions lacking evidence, truth claims based on unreliable authority, ambiguous or obscure concepts’” (Shaw, 2014). Founded on Socratic principles, “...critical thinking is an honoured element of Western thought that is often difficult to master” (Weissberg, 2013, p. 318).

Critical thinking is quite different from Indigenous-culture based reasoning. For instance, the absence of feelings and opinions in critical thinking makes it fundamentally different from culture-based reasoning which is strongly contextual and culturally influenced. Critical thinking is hard to define, i.e. is it a “thing” or a “process”? It is hard to assess whether “critical thinking” has been attained, or when a critical thinking process has been applied. Can we say “more” of critical thinking has been applied here and “less” of it has been applied there? It is also hard to teach (Holmes, Wieman, & Bonn, 2015; Menssen, 1993; Wang & Huibin, 2016; Weissberg, 2013).

Because of its inability to assess, it is a somewhat ephemeral concept to Indigenous adult learners.

Indigenous culture-based reasoning rarely questions assertions and arguments from reliable Indigenous authorities such as elders. As there is no clear indication that the research participants have been “taught” critical thinking prior to or during the study, Indigenous culture-based reasoning is used instead in the text to refer to the historic and cultural assumptions made through the stories that participants had been told that would consequently inform the decisions they made. It is reasoning that is reflective of the epistemologies and ontologies of the context in which such thinking took place.

LTE: Long Term Evolution is a standard for high-speed wireless communication. LTE is a fourth generation mobile phone system that operates at higher frequencies, has higher capacity and speed, and is in operation in most countries and in most urban areas in Canada. LTE can support

many applications. As at the time of this study, it was the most suitable system for distance learning with a mobile device.

Orienteering, Cognitive Shifts and Cognitive Movements: Orienteering, Cognitive Shifts and Cognitive movements are sometimes used interchangeably in this text to describe a learner's ability to create learning routes within a cognitive spatial map of structures and locations. These terms refer to a learner's ability to conceptualize "here" in relation to "there" and to cognitively move back and forth from one cognitive location to the other within a spatial map of structures. This spatial map consists of both Indigenous and Eurocentric learning paradigms. Orienteering as used in this text represents "negotiated learning" between these paradigms. It is a cognitive activity that portrays a learner's cognitive movement as they negotiate their positionality in relation to both their present cognitive domain and potential adjacent domain. As learners orient they acquire more knowledge about their present domain that is relevant and applicable to the adjacent domain, and vice versa. Orienteering is used here similar to an individual's ability to "shift" and "adapt" similar to how individuals shift and adapt between corporal and virtual reality experiences.

1.6 Legal and Policy Imperatives

Support for Aboriginal education is visible across all levels of government and among most post-secondary institutions in Canada. Support is usually framed in policy documents that capture government and institutional intent. Policies such as the Province of Manitoba's University College of the North Act and the Government of Canada's "Digital Canada 150" document both describe government's intent in support of Canadians broadly and Indigenous peoples specifically. This study drew impetus from these two policy documents.

The Province of Manitoba's *University College of the North Act*, passed in the Legislative Assembly of Manitoba and which came into force on July 1, 2004, mandated the university to (UCN, 2016):

1. Provide an integrated college and university approach to offer northern Manitoba greater access to the breadth of post-secondary education.
2. Provide post-secondary education and training fundamental to the social and economic development of northern Manitoba in a culturally sensitive and collaborative manner.
3. Provide the learner with community centered education and training characterized by a culture of openness, inclusiveness and tolerance and respectful of Aboriginal and northern values.
4. Ensure that elders have a unique role in fostering an environment of openness, inclusiveness and tolerance that is respectful of Aboriginal and northern values.

This mandate was captured in the "University College of the North: Recommendations and Action Plan. Report of the Consultation on Post-Secondary Education in Northern Manitoba" document (Kirkness, 2003). The Recommendation and Action Plan document further mandated the university to explore various options including the use of technology and the creation of proximal learning facilities to meet the educational needs of northern communities.

Currently, there are two main campuses in Thompson and The Pas. Thompson is a modern mining community of approximately 15,000 populations located 760 kms north of Winnipeg. The Pas is a town of approximately 6000 populations located 625 kms north of Winnipeg. The University College of the North campuses in Thompson and The Pas offer classroom-based instruction and support to various students in a variety of disciplines. There are also twelve regional centers spread across northern Manitoba. Each center is established with classrooms,

learning labs and administrative offices. They are connected to the main campuses using various forms of remote connection including satellite technology.

A second policy imperative is the Government of Canada's "Digital Canada 150" document. This document promises a comprehensive Canadian approach that allows Canadian citizens to "take full advantage of the opportunities of the digital age" (Canada, 2014b, p. 5). Launched in the Spring of 2014 the strategy resulted from a national online consultation based on 250 submissions received from more than 2,000 Canadians held over three months in 2010 (Levin & Levin, 2013)(Canada, 2014a). This strategy document targeted 2017; 150 years post confederation, as the year to fulfill its intent. It proposed five pillars (Canada, 2014b):

1. Connecting Canadians through high-speed internet access and the latest wireless technologies.
2. Protecting Canadians from online threats and misuse of digital technology.
3. Providing Canadians with the skills and opportunities necessary to succeed in an interconnected global economy.
4. Allowing government to demonstrate leadership in the use of digital technologies and open data.
5. Allowing Canadians to celebrate their history, arts, and culture and to share it with the world.

The first pillar "Connecting Canadians" promised that "over 98% of Canadians will have access to high-speed internet at 5 megabits per second (Mbps) – a rate that enables e-commerce, high-resolution video, employment opportunities and distance education – providing rural and remote communities with faster, more reliable online services" (Canada, 2014b, p. 7).

Consequently, Canadians including those living in rural communities such as in Bunibonibee Cree

Nation should be able to have access to high-speed internet by 2017. At the time of the study the telecommunication service for mobile and internet in Bunibonibee Cree Nation was insufficient to deliver learning over the internet and was far less capable of delivering high-resolution videos or of providing reliable online services.

Other equally important international policy considerations, in addition to the aforementioned two, are also worth mentioning. The “United Nations Declaration on the Rights of Indigenous Peoples (hereafter referred to as ‘Declaration’)” and the “United Nations Convention on the Rights of a Child (hereafter referred to as ‘Convention’)” (UN, 2017) both support the recognition of education in Indigenous communities across the globe as a shared responsibility of multiple members of society. The Declaration highlights the rights of Indigenous peoples to

Establish and control their educational systems and institutions...[and to provide] education in their own language and in a manner appropriate to their cultural methods of teaching and learning...To all levels and forms of education [Article 14]...To the dignity and diversity of cultures, traditions, histories and aspirations which shall be appropriately reflected in [their] education and public information [Article 15]...To [have] specific measures to protect Indigenous children from economic exploitation and from performing any work that is likely to be hazardous or to interfere with the child’s education,...taking into account their special vulnerability and importance of education for their empowerment [Article 17]. [And they have...] the right, without discrimination, to the improvement of their economic and social conditions, including...education [Article 21] (UN, 2008, pp. 1–9).

Both of these international instruments are consistent with the mandates of the Province of Manitoba, the University College of the North Act and the Government of Canada's Digital 150 document.

1.7 Research Purpose

Historically there have been tensions between Indigenous and Eurocentric learning methods in the Canadian education landscape. Indigenous methods, which had existed prior to European settlement, were seriously undermined as Eurocentric methods were systematically forced on Indigenous peoples. Several scholars have attempted to undo these past practices. Strong terms have been used to describe the interrelationship between these learning paradigms. One such term is "cognitive imperialism" that Battiste (1998, 2005) described as having its roots in manipulation strategies used to validate one source of knowledge over another. Battiste here referred to the role that European settlers had played in validating Eurocentric learning methods over Indigenous First Nations ones. She further argued that Indigenous people must be involved in reconstructing the principles underpinned by their own worldview as a way of liberating themselves from such imperialism. She suggested that linguistic competence is one approach. However, this competency should not be in compliance to Eurocentric forms but in orienteering towards a pragmatic process that equitably stresses reciprocity, respect and non-interference (1998, p. 24). Scholars such as Atleo (2001, 2006, 2008, 2009), Archibald (1997, 2008a, 2008b), Michell, Vizina, Augustus, & Sawyer(1999), and Michell et al. (2008) have explored pragmatic approaches that stressed respect, reciprocity and non-interference between both paradigms. This study contributes to the growing knowledge in this area by exploring the role of digital technology for understanding orienteering between Eurocentric and Indigenous methods. Communication is important in this context and digital technology may help in facilitating dialogue, improving engagement, assisting learners to

learn, improving participation among learners and ultimately assisting in mutual policy formulation (Mackintosh & Coleman, 2003; Utulu & Alonge, 2012). Most importantly, digital technology can help Indigenous learners in orienteering between both Indigenous and Eurocentric worldviews.

The purpose of the study was to explore the determinants necessary for such orienteering and adaptation between domains present in a learning context. It is important therefore to understand how technology plays this role of facilitating such orienteering and adaptation. Virtual reality frameworks, as described in this study, are used as a technological means of understanding the conceptual interaction between Indigenous and Eurocentric domains.

1.8 Conceptual Framework – Virtual Reality Frameworks and Cognitive Movements

Virtual models of realities that provide understanding of how other “worlds” work have been an ancient phenomenon (ECREA, 2011; Leopard, 2012). Humans had devised means of experimenting in virtual worlds in order to gain an understanding that could help them better comprehend the corporeal world. This notion that the virtual and the real are alternate but adjacent “worlds” is interesting. This notion helps us to explore benefits that could accrue from one world to the other by experimenting in one world and applying the lessons learned in the other world. Ultimately, we learn how to cognitively move from one world to the other seamlessly by creating spatial maps between them.

The ability to adapt to conditions in which we find ourselves – in one world – often originate from an internalization of our circumstances, a conceptualization of adaptation strategies and an externalization of options in ways that help us understand ourselves. With these we learn to cope with our world and then make meaning of new approaches for addressing any present and recurring conditions in our world (Andrews, 2007). Our use of digital technology has influenced

the conceptualization of our current world and the adaptation strategies we use to cope with this conceptualization. This influence is evident in the area of relationships, such as in the ways we develop new relationships or nurture existing ones and in how we communicate with ourselves in these relationships. Interestingly, a significant amount of interaction is conducted online through emails and texts, social networks, virtual reality interactions and many other digital forms of social interactions. At work or at home, social interactions have co-existed in both the virtual and the corporeal worlds. Presently we create virtual reality either for pleasure or for work to undergo some form of experimental experience in areas of medicine, computing, entertainment, aeronautics and in education (Ibrahim & Kahn, 1987; Johnson & Raye, 1981; Jussim, 1991; Klug et al., 2006; Latta & Oberg, 1994; Mattessich, 2003; Santtila & Roppola, 1999; Schmidt & Hauptmeier, 1984; Stapp, 1977; Webb, 2001).

Multi-million dollar businesses have emerged from the entertainment industry in areas such as online-gaming, pornography and many others that have explored this growing virtual reality field of human enterprise. The not-so-obvious activities such as fine arts, urban design or archeology also fall in this area of human enterprise. By using digital technology to develop models of reality, humans have been able to simulate conditions to see if ideas work and if they can be applied to the corporeal (Bertram, Moskaliuk, & Cress, 2015; Passig, 2015; Peckmezian & Taylor, 2015; Vignais, Kulpa, Brault, Presse, & Bideau, 2015). As a consequence, humans have been able to visit space, fight wars, navigate undersea terrains, simulate flight and simulate complex health related scenarios. Most of these have been done from the comfort of their homes, research labs, couches or work cubicles.

Recently, virtual reality applications exist as mobile devices and on virtual reality social media sites like Second Life and Oculus Rift for use in nearly every life situation. They are not as

far-fetched as they once were. Using simple headsets and a smart mobile phone, learners can explore various kinds of virtual worlds.

The absence of digital technology in the past did not prevent experimentation of virtual reality worlds then. Atleo (2001, 2009) for instance describes 4500 years old whaling activities in the *Nuu-Chah-Nulth* tradition of the Coast Salish community in British Columbia, Canada, where physical economic activities were modeled virtually and then elements of these activities were eventually practiced in the corporeal context. She tells the story of *Umeeek* “which means “a person who can get (meek) anything (U) because he or she knows how to learn to get it” (2009, p. 454). *Umeeek* characterized the body of a dead whaler in order to provide questers with a model/heuristic framework that they could use as their training stimulus and ritual to simulate the conditions in which the actual activity might occur.

This mode of learning through modeling reality in ceremonial and ritual activity provided a deep template for teaching and learning that informed their practices then and which could inform ours today. In fact, one could say what Indigenous people often say, that we just need to reach back to see what we are missing in our search for knowledge about how to do things. Today, we have emerged with appropriate forms of technologies such as clothing, various forms of housing, cutting and hunting implements and many more coping, behavioral and adaptation strategies (Webb, 2001), some of which we had initially explored virtually and then produced in the corporeal world. We have applied age long traditional strategies, knowledge and practices for conceptualizing space, time and distance and have used these to reconstruct models of reality (Carlson, 2007).

For my Indigenous experience as a rural Nigerian in a colonized history, which is similar to much of Canadian Indigenous experiences, virtual reality worlds were created through narrative

expressions such as self-talk, songs, models, stories, dances, memes, myths and parables, etc.

These expressions conjured up reality for the participants. They transported the participants into realities that were different from, yet adjacent to the corporeal. The experience from these narrative expressions may be similar to the experience of reading of books or playing with toys that enables us to transport into the book author or toy creator's world. Those who could afford books or toys may experience these luxuries more frequently than perhaps those who either through poverty have to create their own realities or rely on realities that are culturally constructed by their communities. An example of this is captured in the following reflection:

As an African by birth, I am often reminded of my childhood storytelling circles and the stories told by parents, aunts, uncles in the village, often in the quiet of the evening with the bright moon pasted on the dark blue skies and stars twinkling against unadulterated backdrops. Flames flicker from little wicker lamps through the doors of the various huts. They are not needed but they provide the light required to reach the community kitchen situated at the corner of the clearing so that they look like little dancing flames from the distance as its carrier walks back and forth. Next to the kitchen are huts made of beautiful brown bricks and thatch roofs of straw. Plastered on the inside with mortar and smoothly polished floors, they provide natural regulation of heat and cold in frigid or hot temperatures.

In the center of these huts is a large clearing where the clan gathers every evening to listen to the stories told by my grand parents or the eldest uncle or aunt with the responsibility of dishing out the wisdom for that night. Supper would have been had and the last ounces of energy dissipated as the younger kids crumble in a heap in the innermost parts of the cycle from playing the traditional hide and seek. When the crickets

begin to chirp and the occasional cry of the night owl resounds, everyone knows it's story time. Community members, cousins, nieces and nephews – clan members all sit in a cycle on stools made from tree trunks or on the floor and all attention shifts to the story teller.

It is from here that stories of the wisdom of the tortoise and the hare (jack rabbit) are told. Stories about how the tortoise's dishonesty resulted in his fractured shell, and how the speed of the hare made him appear to be omnipresent, only to fail because speed was not wisdom. My mother told stories of resilience and persistence gathered from her parents on how a unique objective can be achieved by being open to exploring different options. I recall her saying there were "many ways to the market" and no one particular way defined the surest route. It was about the many possibilities available to anyone that chooses to remain focused and objective about their life's struggles. From these stories, life lessons were learned that have shaped me (personal reflection).

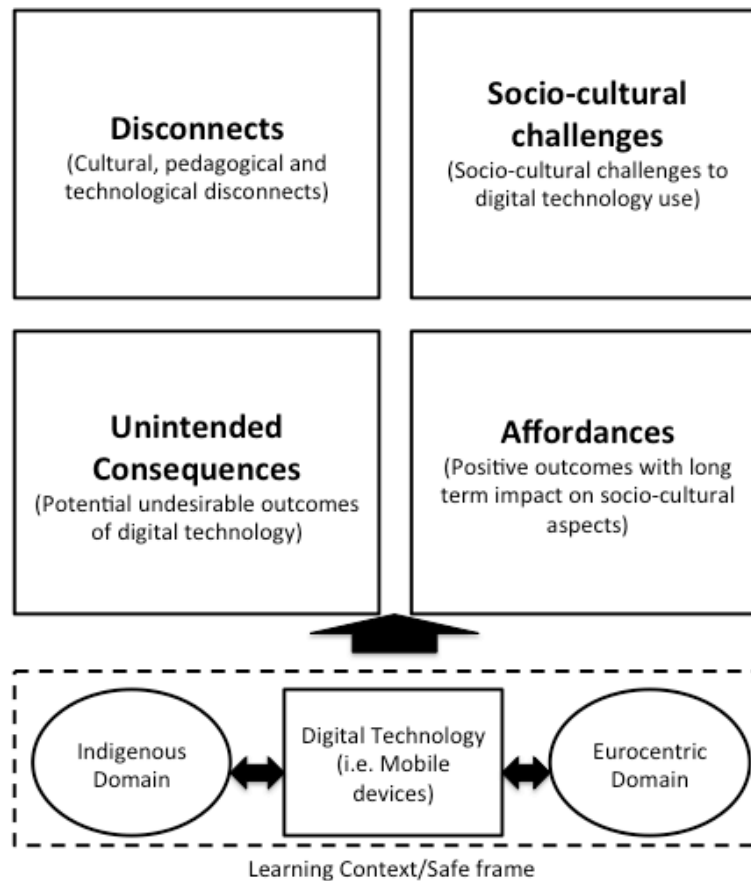
Through these stories I was transported into virtual worlds from which new realities were constructed, lessons learned and vision for the future crafted. Today, the abundance of handheld digital technology arguably provides children access to many virtual reality experiences.

The ability to explore the relationship between the virtual and the corporeal could help us to appreciate the concept of spatial cognitive maps that results from the co-existence of Indigenous and Eurocentric worldviews that this study addresses. It is important then to explore existing schemas of this type of relationships.

The conceptual framework used in this study was derived from three frameworks that explored this notion of the co-existence of the virtual and the corporeal. The resultant framework that I called the "Mobile Technology Mediated Adaptive Orienteering Framework" brought together elements of the three. This framework provided an initial conceptual understanding of

cognitive movements between the domains described in this study. As the study progressed it became apparent that this framework as initially conceptualized was insufficient in adequately capturing the goals of this study, hence the emergence of the Techno-Culture Adaptive Framework, which is briefly described in this chapter and in more details in chapter 5 (see figure 2).

Figure 2: The Techno-Culture Adaptive Framework



The first framework that explored this co-existence between the virtual and the corporal is based on an evaluative schema that explored trainees' response of a virtual training environment (Bertram, Moskaliuk & Cress, 2015). The researchers in this study argued that for virtual reality training to be effective the importance of perception, the relevance of perception, and the value of the training content should be present in the training program. For these authors, perception is

described in terms of relevance of the training and the value of the training to the trainees (Bertram et al., 2015, p. 286). Their study involved 23 participants set up into three training groups consisting of a control group, a standard group and a virtual group, each with 8 participants. The control group had seven participants. Their objective was to measure police trainees' reactions to virtual reality training on complex collaborative tasks (what they termed as the motivational outcomes and perceived value of the training) and to ascertain the level of knowledge transferred. They evaluated the level of acceptance by measuring whether trainees attitude were positive about their training experience, whether they were satisfied, whether the training was relevant and the skills learned in the virtual simulation were applicable to the trainees' real life environment. Table 1 shows a schema of their framework.

Table 1: Framework for evaluation of virtual training

Motivational Outcomes	Acceptance
	Satisfaction
Perceived Value of Training	Relevance
	Subjective learning success
	Subjective assurance
	Realism of training

Note. Reprinted from Virtual training: Making reality work? by Bertram, Moskaliuk & Cress, 2015 used with permission.

Participants were trained virtually for two days and then subjected to two weeks of corporeal training and operations. Assessment of learning was taken before and after the training and the reactions to the training were measured after the training and the operation. Their results indicated that the virtual training conditions did not produce motivational outcomes as high as those of the standard group and that the overall perceived value of the training was higher among the standard group than with the virtual group. The standard training led to better learning and knowledge acquisition outcomes than the virtual training group. However, overall and at the

conclusion of the real operation, the virtual team showed better results “in the more complex scenario than the others” (2015, p. 291). They also felt more secure during the operation and were more satisfied with their performance.

The authors of the study argued that the virtual training had better effect than the standard training because it produced more realistic results and a more dynamic training environment than the others. They suggested that virtual reality training leads to more automatic corporeal performance and more cognitively astute participants who are better at processing inferential tasks than the other groups. Thus, the concept of virtual reality training seemed to hold utility among learners who sought more dynamism in their training environment and more holistic knowledge in the concepts for which they intended to learn.

The second framework that explored this co-existence between virtual and corporeal learning is based on the notion of “lostness”. Lostness describes the experience of getting lost in a virtual world. The metaphor of “world” in the “World Wide Web” used to describe the internet is consistent with this concept. It describes another world open to submersion which individuals tend to experience as they click through links that take them several levels deep. This virtual space is contrasted against the corporeal world but also adjacent, so that one seemed to be an extension of the other and vice versa. Where individuals used to walk to a physical building such as to a bank, school or a community center to socialize, they now fully do so virtually in an online environment or blend that virtual online experience with a corporeal one.

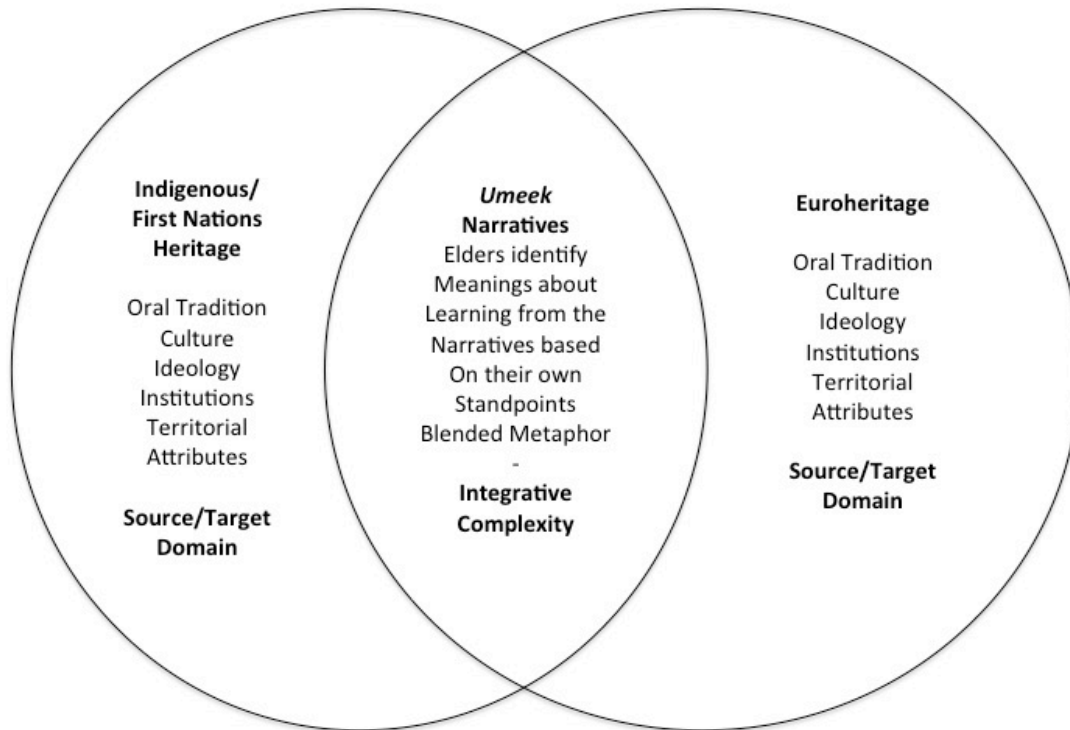
Edward and Hardman’s (1989) experience of navigation within a hypertext environment is perhaps one of the earlier studies depicting this *virtually real* nature of internet technologies on humans and their experiences. The authors describe the feeling of “lostness” in hypertext as one in which the user has no clear conception of relationships within the system or a knowledge of their

present location relative to other structures. Specifically, lostness results when the individual does not know where to go next, knows where to go but not how to get there, or does not know their exact location in the overall structure of the virtual world. Having a cognitive spatial map of structures, location and routes may increase an individual's ability to generate specific navigation routes on existing routes or to traverse new ones. However, it does not necessarily help orientation abilities or the ability to conceptualize "here" in relation to "there" (Edwards & Hardman, 1989, p. 106).

There seems to be a correlation between satisfaction of being in a virtual environment and the feeling of not being lost in the way "knowledge of the arrangement of information" relates to the "user's current positions within it" (1989, p. 122). This knowledge in the arrangement of information, spatial map of structures, location and routes attained through lessons passed on by culture-based stories, arguably underscore how Indigenous learners are able to navigate complex corporeal contexts.

A third framework that explored the interrelatedness of virtual and corporeal learning is captured in Atleo's (2011) depiction of phenomenological field of metaphorical mapping. Atleo speaks of this framework as a social protocol that is useful for talking with Aboriginal elders about cultural understandings of learning (see figure 3).

Figure 3: Phenomenological field of metaphorical mapping



Note. Reprinted from Learning Models in the Umeek Narratives: Identifying an Educational Framework through storywork with Elders by Atleo (2001) used with permission.

Atleo's work "recognizes the adaptive ability to move between phenomenological fields and indeed world views operationalized through a process of mapping salient aspects of metaphors from one conceptual space to another" (Atleo, 2001, p. 455). Using metaphors as the mapping of one idealized cognitive model over another, Atleo explored how Aboriginal elders used metaphors from their Indigenous heritage to understand concepts in the adjacent Euroheritage, and vice versa. Atleo argued that

The idealized cognitive model is perceptually held by an individual based on experience or as an action schema. The model that is held (Source) is superimposed on something similar (Target), and the two are subjectively compared. In this case, the models of

learning that the Elders understood in a *Nuu-chah-nulth* perspective and from the narratives served as the Source were compared with those Euroheritage models of learning with which they were familiar based on their experience of Euroheritage schooling which was the Target. This was possible because metaphors can be understood as conceptual artifacts of experiences, philosophy in the flesh, where language and experience meet in embodiment. Metaphoric blending and integrative complexity then serve to facilitate ongoing orientation by and for the skillful cultural person in which both affective and cognitive dimensions of experience and action are employed as models mapped from one domain or action context to another. Their similarities and differences become apparent in the process where a transfer of learning or insight occurs (p. 456).

These three frameworks (see Figure 4) collectively permitted a conceptualization of the relationship between learning in the virtual world and the effectiveness of this type of virtual reality training on the corporeal world (Bertram et al., 2015). By exploring this relationship participants were able to exhibit a certain level of acceptance and to generate motivation sufficient to substantiate this type of virtual/corporeal training. The relationship between the virtual and the corporeal also helped to underscore the fact that experimenting or learning in a virtual world could produce a feeling similar to that of lostness. In this context, spatial maps of structures and locations could be created by learners who could use them to navigate between the corporeal and the virtual, and who could use the lessons learned to navigate similar but complex learning domains within a particular learning context (Edwards & Hardman, 1989). Cognitive movement between contexts within a cognitive spatial map is not often easy to attain. For movement to happen, a zone of “integrative complexity” (Atleo, 2001) has to be created. This zone is a blend of multiple domains. However, upon attaining such zone, learners are able to identify lessons and

make meaning based on their knowledge of one domain and its direct relevance to the adjacent domain.

Figure 4: Mobile Technology Mediated Adaptive Orienteering Framework

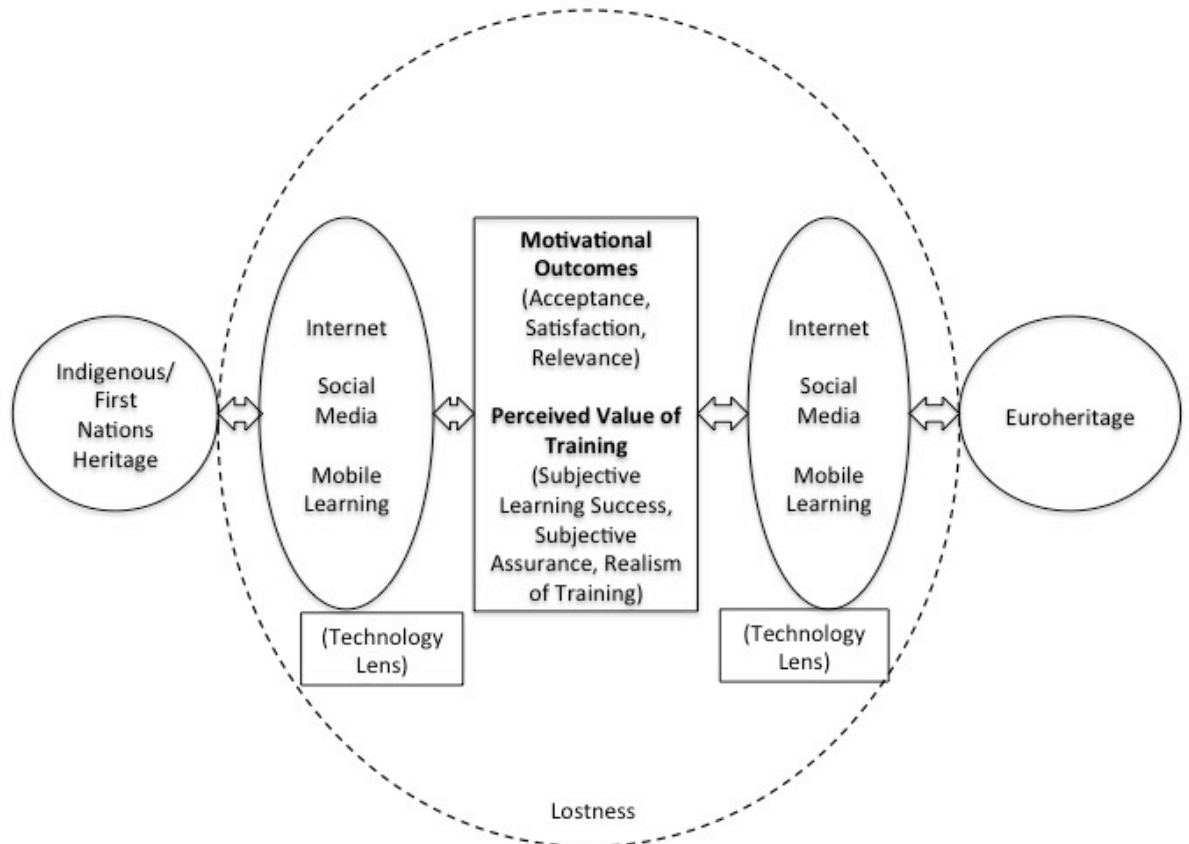


Figure 4. Mobile Technology Mediated Adaptive Orienteering Framework. Adapted from Learning Models in the Umeek Narratives: Identifying an Educational Framework through storywork with Elders by Atleo (2001), and from Virtual training: Making reality work? by Bertram, Moskaliuk & Cress, 2015, and from 'Lost in Hyperspace' Cognitive Mapping and Navigation in a Hypertext Environment by Edwards & Hardman (1989).

In exploring the determinants of learning across multiple domains for a sample of Indigenous learners in this study, aspects that engender negotiations and adaptation from one domain to the other become important for learning to be successful. These determinants are described in more details in the result findings in chapter 4 and 5.

1.9 Research Limitations and Delimitations

It is important that I describe my interest in this particular study. I am not of Indigenous Canadian origin. However, I would describe myself as a Canadian of foreign Indigenous origins, specifically from the Idoma people of Benue State of Nigeria. I became passionate about this study because of my previous engagement in several education and technology development projects in Africa, which have benefited many Indigenous communities. While the conditions in Bunibonibee Cree Nation were not the same as those in the African Indigenous communities I had worked, the fundamental issues of access and connectivity either for education, telemedicine, research, social connections or digital commerce were arguably similar.

I recognized that conducting a study in Aboriginal communities would be challenging. The research context was vast. This area of Indigenous research seemed incredibly polarized and individualistic because it required me to meet the standard of Western research. Consequently, there existed deep-seated divergence between scholars of the research context (Michell et al., 2008). As with most research studies the underlying question often related to the originality of new research and whether it contributed new knowledge. I was concerned about the possible contributions that I could make to an already thriving field of Indigenous research and a growing area of digital technology in Indigenous learning contexts.

Indigenous research is complex and difficult to situate into any one particular area. Indigenous research takes on many dimensions and cover different themes and geographic contexts. For instance, broad-based Indigenous research could cover comparative analysis of different Indigenous peoples (Chinyere, 2013; Slater, Luckman, & George, 2013). It could be narrowly focused and made specific to a thematic or geographic area such as those related to Indigenous social memory. It could be used as a tool for identity formation that addresses

environmental issues (Mistry et al., 2015). It could also be used to counter the stigma associated with Indigenous identity (Gagne, 2015). Irrespective of how broadly or narrowly it is defined permeating this spectrum is often the pointed and opinionated debate on the generalizability of research in Indigenous contexts (Chen, 2010).

Generalizability is contentious (Bronfenbrenner, 1977; Raham, 2009). There are differences between communities and between individuals in communities so that generalization is problematic (Benyei, Turreira-Garcia, Orta-Martínez, & Cartró-Sabaté, 2017). The concept of generalizability tends to assume that enough conditions and factors are similar and therefore the “treatment” applied to one case could be applicable to the other.

Generalizability was precluded in the narrative inquiry approach used in this study. Narrative inquiry was used for gathering data because it aligned with the story-telling culture of Indigenous people (Cardinal, 2010; Young et al., 2010) without expectations for generalizability. Anchoring narrative inquiry in the Deweyan theory of experience, Clandinin & Rosiek, (2007) gave voice to experiential forms of inquiry that are valid and credible. Narrative inquiry may be incommensurable with other research paradigms such as post positivism, critical theory and post-structuralism. These other research paradigms were deemed unsuitable to this research context.

Yet another issue lay in the extent to which research participants can build confidence in me as a non-Aboriginal researcher. This sort of confidence that allows the researcher to be accepted in the community must be earned given the many negative stories and past experiences that Indigenous people have had with outsider researchers (Kingsbury, 2001; Richards & Scott, 2009; Sharpe, Philpott & Bourgeois, 2011; Wotherspoon & Schissel, 1988).

The confidence to work in the community was developed from four areas. Through:

1. Constant dialogue and interaction with the community and its members for over two years prior to commencing the study.
2. Complying with the ethics and protocols related to conducting Indigenous research in the community. These protocols consist of the following:
 - i. Tri-Council Policy Statement on Ethical Conduct of Research Involving Humans (TCPS) (GC, 2014; PRE-TACAR, 2008).
 - ii. The First Nations Principles of Ownership, Control, Access and Possession (OCAP) (OCAP/FNIGC, 2013).
 - iii. The Integrated Knowledge Translation (iTK) framework (CIHR, 2012).
3. Securing ethics approval for the research from:
 - i. The University of Manitoba Ethics and Nursing Board (ENREB).
 - ii. The University of Manitoba Tri-Council Policy Statement (TCPS 2) Course on Research Ethics (CORE)
 - iii. The University College of the North Research Ethics Board (UCN-REB).
4. Securing consent from the Chief and Council of Bunibonibee Cree Nation.

Compliance to these ethics, protocols and community interactions culminated in the construction of what may be termed a “safe frame” (Campling, 2001; Miller, 2001). Safe frames thrive in the presence of safety and openness. These elements are necessary for Indigenous people to interact with their community helpers such as healthcare providers (Campling, 2001). This concept of safe frames is one that is not constructed by the outsider but by the participants and their community. Afterwards, outsiders are invited to enter therein. Safe frames create an environment in which participants can confidently share information, knowledge and experience between themselves and those invited to participate.

1.9.1 Insider/Outsider Dilemma

Researchers who share the same identity, language, and experiential base with their study's participants are often called insider researchers (Dwyer, 2009, p. 58). Their position as insider researchers is likely to increase their acceptance by community members, to legitimate them to conduct research in their community and to experience more open communications with research participants. A significant benefit for insider researchers over outsider researchers is that insider researchers have pre-existent access to the study community and they enjoy common ground with research participants. The insider researcher has a "starting point (the commonality) that affords access into groups that might otherwise be closed to outsiders" (2009, p. 58).

Most ethnographic researchers experience insider-outsider dilemma during research (Dwyer, 2009; Merriam et al., 2010; Thomas, Blacksmith, & Reno, 2000). Even studies that are systematically designed using an insider-outsider approach, such as Thomas et. al's. (2000), are confronted with challenges including the potential fragility of the research team and the need for constant team building with participants (p. 823). Another concern relates to ethics, confidentiality and privacy (Thomas et al., 2000, p. 826), which is addressed later in this section.

1.9.2 Insider/Outsider Research: Situating Self in the Research Context

I approached the study as a Canadian of African descent who had implemented several technology and education projects in Indigenous communities in Africa and had witnessed the utility of technology for transforming economies, improving communication, and enhancing social interactions (Mignone, Henley, Brown, O'Neil, & Ross, 2008). Projects such as the social media election-monitoring project (Akoh & Ahiabenu, 2012), radio in shaping developing country economies (Akoh, Jagun, Odufuwa, & Akanni, 2012) and fiber infrastructure for grassroots access and connectivity (Akoh, 2005) are exemplars of projects I had undertaken that addressed

development concerns. Parallels could be drawn between African and Canadian Indigenous' contexts in the areas of access to information and access to knowledge, access to robust technological infrastructure and access to sound educational infrastructures. While there were notable parallels, differences also existed between African and Canadian Indigenous contexts that posed limitations to the study. One limitation concerned access to the community for research purposes.

1.9.3 Access Policies

First Nations research access is guided by many protocols and arrangements. Some of these include the aforementioned ethics and protocols. This study recognized these policies and protocols. The study was based on respect for community cultures and traditions. The research activities were designed with applicable levels of restraint where necessary so that participants did not feel pressured and compelled to complete research activities. The research process and my interest in the study were clearly stated up front.

As I explored these protocols and as I drew similarities and differences between this Indigenous context and the ones with which I was previously engaged, I acknowledged the positions taken by Crooks, Snowshoe, Chiodo, & Brunette-Debassige (2013) who suggested that despite significant differences between contexts, there were also “significant similarities (especially in cultural and language groups of Indigenous peoples who cross the Canada/U.S. border) both in the colonization experience and its after-effects, and in some of the core values and worldviews” (2013, p. 14). I acknowledged that my colonial experience in my home country was similar to those of my research participants.

1.9.4 Clarifying the Insider Outsider Dilemma

Despite the differences, our similar colonial experiences seemed to suggest that there could be mutual benefits to the study community and I. As I gained understanding of insiders' direct relationship to a phenomenon, I learned also that outsiders could provide useful and corroborative experiences that could benefit the research context (Damianakis & Woodford, 2012; Dwyer, 2009; Merriam et al., 2010; Paechter, 2012; Thomas, Blacksmith, & Reno, 2000). While there exists a clearly drawn boundary between the insider and the outsider, they may both be affected by their specific experiences. Sometimes, insiders may require outsider perceptions, and vice versa. For the outsider a conflict of positions often questions the authority s(he) has to conduct the study, questions to whom the intellectual property of the study belongs, and questions about the ethical grounds on which the outsider must stand to express an insider phenomenon (Damianakis & Woodford, 2012). Justifiably, narrative inquiry somewhat addresses these concerns such that the researcher's experience is intertwined with those of the Indigenous study community (Craig & Huber, 2007), thus providing an interesting insider/outsider research phenomenon on its own.

The definition of Indigenous people remains variable because "only Indigenous peoples could define Indigenous peoples" (Corntassel, 2003). For context, however, it is used here to represent persons and communities situated on a land, who have developed a local culture, live by a local culture and live within a local context. Indigenous people include First Nations people of Canada and the Idoma people of Nigeria from where I originate.

As a non-Aboriginal Canadian of Indigenous African descent my research interests concerned Indigenous people broadly and Indigenous Canadians specifically. Within the context of insider/outsider research described earlier, my internal struggles for ownership of the research

and identity as a researcher in this process and their relevance to the study came to the fore. These struggles had to be addressed. One important struggle related to whether my identity as a non-Indigenous Canadian can conduct or situate self within the peripheries of Indigenous research. I'll discuss this further in relation to the Seven Sacred Teachings of the *Anishinaabe* and the African philosophy of *Ubuntu*. As such, it is important that I describe my research interest from an African perspective.

1.9.5 Philosophizing “the other” from an African Perspective

One aspect of this conceptualization of identity related to the notion of “being” or of “existence” of the other. This conceptualization is often captured in the African notion of “*Ubuntu*” which is enshrined in the core of a being or the *raison d’etre* of human’s existence. English translations of this notion produces words such as humanity, humanness, or even humaneness, but “these translations involve a considerable loss of culture-specific meaning” (Louw, 2001, p. 15). This version of the word “originates from the Zulu, Xhosa, Swati and Ndebele languages of South Africa” (Binsbergen, 2001, p. 53) with its more glaring expressions permeating the broader Southern and Eastern African region. As a pan-African concept it depicts a (Kamwangamalu, 1999, pp. 25–27):

Multidimensional concept which represents the core values of African ontologies such as respect for any human being, for human dignity and for human life, collective sharedness, obedience, humility, solidarity, caring, hospitality, interdependence, communalism, to list but a few...[it represents] a value system, which governs societies across the African continent. It is a system against whose values the members of a community measure their 'humanness'. These values, like the Ubuntu system from which they flow, are not innate

but are rather acquired in society and are transmitted from one generation to another by means of oral genres such as fables, proverbs, myths, riddles, and story-telling.

To bring meaning closer home, the phrases “a person is a person through other persons” (Louw, 2001, p. 15), and “a human being is a human being through the otherness of other human beings” (Louw, 2001, p. 23) are often used to describe its essence, but even then, they do not fully capture its meaning, nor do they do justice to its etymology.

As a pan-African concept, the closest elaboration of *Ubuntu* in my mother tongue from the Indigenous Idoma of the Benue people of Nigeria is “*Inalegwu*”. The Idoma native people of Nigeria are situated on the banks of the River Benue, one of the two rivers that give “life” to the country of Nigeria. The Idoma is a people blessed with tremendously vast natural resources and the skills to hunt, farm, fish and gather and who have done so for several centuries. *Inalegwu* is a:

Sacred trust in Idoma culture or spirituality that governs human relationships and is believed to be the oversight or consequences enforced by both the most high God (*Owoicho*) and the spirits of the ancestors (*alekwu*). *Inalegwu* demands that I almost competitively outperform my fellow men in good deeds towards them, thereby securing their *Inalegwu*. By so doing even those around me that may consciously or unconsciously seek to do me harm will experience a boomerang effect of their intended evil, being that I already secured (or "collected," if translated literally) their *Inalegwu*. Under the same concept, if I seek to do my neighbor harm, I lose my *Inalegwu* to my neighbour and I'd suffer the negative intended repercussions instead. The concept is applicable to individuals, families, communities, etc. Hence the great emphasis in Idoma culture on hospitality ensures that everyone endeavors to outperform the next person so as to shore up positive *Inalegwu* even towards strangers they do not know. Although with pervasive

greed, foreign influence and negative impact of capitalism this is gradually becoming a thing of the past. An applicable proverbial saying in Idoma goes "*Inalegwu kwu obu efu, kwu obu unu!*" By interpretation, "*Inalegwu* precedes and assures victory in battles (or wars) and strife". So why will I seek or wish you ill when in the end if unprovoked, I will be harming myself? (E. Omakwu, personal communication, July 20, 2016).

The complexity of the term cannot be described here, other than to further assert that it encompasses a broad variety of human aspects including respect for the other (Kamwangamalu, 1999); in much the same way as respect is described as one of the Seven Sacred Teachings of the *Anishinaabe* (TRC, 2015). Respect in this form builds on the cultural integrity of the other (Kirkness & Barnhardt, 2012), on cultural differences (Deer, 2010) and on recognition given even to deceased members of the community (Sigurdson, Paulson, Poonwassie, Johnson, & Einarson, 2012).

Respect here also extends to nature and to animals. In Indigenous Canadian prairie culture, the Buffalo, an animal of great sustenance and support to Indigenous people provides "shelter, clothing and utensils for daily living" (Circle, n.d.). For this reason, the people take care of the herd and consequently establish a sustainable relationship based on a "deep and embodied awareness" that provokes wakefulness and responsibility (Cardinal, 2010, p. 263). Atleo's (2006) description of oneness in the *Nuu-chah-nulth* philosophy is that all things, including resources are sacred and to be treated with respect, as if they were gifts. And that this philosophy is a "framework in which spirituality, sacredness of life and of the earth are the core of culture (Atleo, 2006).

The similarity of this concept of respect either in the broader context of the Sacred Teachings of the *Anishinaabe*, the *Nuu-chah-nulth*, the African philosophy of *Ubuntu*, or the

Idoma notion of *Inalegwu* causes a feeling of wakefulness and responsibility, and a sense of consciousness about my interaction with the community of my research.

In approaching Bunibonibee Cree Nation, I found that respect for the peoples, the elders, the culture and community was foundational to gaining entry, was important for sustained access in the community and essential for the way I report the study.

This form of respect characterized my approach to a community broker who brokered access to the community. Through respect, we identified a common base – the humaneness of the other and respect for human existence and the sanctity of Indigenous research. This broker would eventually become the champion of the research, the facilitator of relationships and of access into the safe frame. Four key concepts seemed to provide (but did not guarantee) access to the research context:

1. Full disclosure to the community and its members about research intentions.
2. Recognition of the fragility of the relationship between the researcher and the community and the need to proceed with caution.
3. Reconceptualization of time as enshrined within the *Anishinaabe* and *Ubuntu* concepts of respect conceived as a higher order argument.
4. Recognizing relationships as mutually beneficial to all involved.

a) Full disclosure: Clarity in communication was essential for full disclosure. The community broker who was also an academic ensured that I developed clear and simple concepts of communication during all correspondence and engagement with the study community. Clear communication is encapsulated in the Seven Sacred Teachings of the *Anishinaabe* as truth, respect, and honesty. Truth is described as embracing the reality without being judgmental. Therefore the study was conducted in honesty and in a “manner where responsibility and

accountability go hand in hand...[respectfully knowing that the research participants] are sacred” and respected (Toulouse, 2008, pp. 1–4). This concept is consistent with *Ubuntu* because it required full disclosure about the research, that I maintain a truthful position about my research and that its purpose benefits the community and the research participants.

b) Proceeding cautiously: Recognizing that securing access to the safe frame did not necessarily guarantee sustained access into the study community, there was the need to tread cautiously throughout the research process. While gaining entry into the safe frame was important, sustained access was established after each research activity was undertaken. Participants conferred confidence in me when I allowed them several attempts during each activity even though they might have been prevented from having more attempts. As I acquired more confidence I was able to communicate more and to share freely with research participants – all of these were done within the confines of the safe frame.

c) Redefined concept of time: The research activities were framed around participants’ availability and as a result were not executed in the sequence that they were originally proposed. Factors including familial responsibilities and other commitments (Cherubini & Hodson, 2008; Huber, Caine, Huber, & Steeves, 2013; Johns, 2006; Stehling & Bach, 2011) made it nearly impossible to conduct the study according to the stated plan. Offices and schools were often closed on the occasion of death of a community member. To show respect, no research activities were scheduled and none could be conducted when participants grieved. I had to respond to the participants’ lived reality.

The ability to recognize participants’ emotional state is essential for successfully conducting research activities in a safe frame. I was often concerned about participants’ feelings and emotional stability throughout the study. As an outsider researcher I had to become aware of

the contextual specificity of the research location, the emotional stability of the research participants and their mental health and well being. I had to recognize that they could be facing circumstances which they intend not to disclose, but which could have significant impact on the research data and the entire research process. Ultimately, this was the right thing to do. The objectives of the study were attained irrespective of the sequencing of the study activities. In the end, I was bound to show respect and follow the lead of participant availability.

d) Giving back: There was an ethical consideration from university ethics protocols that required researchers to remove any coaxing elements or inducements for research participants that could potentially lead to skewed research results. This provision, which was present in both the University of Manitoba and the University College of the North's ethics protocols, were meant to protect the integrity of the research process. They should however not be confused with the notion of "giving back" to the study community. I observed that conducting a research in this Indigenous community required a promise of "giving back". Giving back as depicted during the research was not meant to favour the research participants, neither was it meant to skew the research results. The study was framed so that the study community as a whole could benefit from its outcome, such as for instance, sharing the knowledge resulting from the research with the study community and granting them ownership of the outcomes. Recent elaborations of knowledge transformation frameworks such as the Integrated Knowledge Transfer framework were useful because they described "giving back" research knowledge to the community as a necessity that must be performed (CIHR, 2011, 2012; Hanson & Smylie, 2006). Research benefits could be both intangible and tangible. Intangible benefits could be outcomes that are intellectually stimulating, such as the provision of cognitive growth or knowledge that participants and their community could benefit from. Tangible benefits such as the production of digital artifacts including

webpages, policy report, advocacy initiatives or project residues that benefit the study community (OCAP/FNIGC, 2013) are owned by the community upon conclusion of the research. Both of these should be given back to the community.

While my insider/outsider dilemma created a potentially difficult research situation, through the help of the research participants, policy frameworks, community members, and similarities of Indigenous context, I was invited into a safe frame that allowed me to establish relationships required to conduct the research. The four elements above were essential for communication within this safe frame and were necessary for gaining the confidence of the research participants.

1.9.6 Geographic and Contextual Limitations

Another limitation of this study related to the challenge of geographical distance. The study involved traveling to and living in the fly-in community of Bunibonibee Cree Nation. Most of the research activities were conducted during the winter months. Traveling was largely dependent on the availability of flights, which were sometimes irregular. Available accommodation was largely dependent on the goodwill of the University College of the North who had periodically provided a suitable cabin adjacent to the center. Research funding to cover travel to and from the research location and sustenance was unavailable until a late grant was secured to cover some expenses. Most travel cost was paid out of pocket.

Booking a flight to the research location did not often guarantee arrival on site. Some flights were diverted to Thompson because of poor visibility. I would often incur unbudgeted expenses by spending unanticipated nights at Thompson. Factors like these affected the research plan. A great degree of flexibility was required.

On days when I arrived on schedule, primary participants were sometimes unavailable because of their familial and work related commitments. Sometimes there were deaths in the community, which prevented any research activity from taking place. The emotive state of research participants had to be considered especially during periods of death in the community. Research activities were canceled on these instances.

Meeting with elders depended on their availability and willingness. A mediator who would facilitate access and moderate the interaction with the elder was often required. Mediators were not always available. Most of these factors determined the extent to which a substantial amount of data could be gathered for the research.

1.9.7 Limitations on Consideration of Cognitive Shift

Another limitation of the study related to the perception of cognitive movement from one cultural domain to another. Numerous studies exist that describe scientific methods for examining cognition (Cairó, 2011; Cardenas et al., 2011; Huang & Zhou, 2013; Ohlinger, Horn, Berg, & Cox, 2011; Steffener et al., 2014). The study of cognition and the associated research methods fall within the domain of brain and neural-science in fields such as gerontology, brain disorder, child and infant development and kinesiology. These studies determine cognition by measuring impulses, usually MRI scans and then applying statistical regression tools and analysis to determine outcomes.

While these scientific methods might be useful in their respective areas, they do not deal with cultural shifts and are not often suitable for multicultural negotiations in Indigenous settings such as the research environment described in this study. Some factors that make them unsuitable include:

1. Scientific methods are potentially invasive. Indigenous participants would have been unwilling to subject themselves to potentially intrusive methods.
2. The safe frame constructed for this research would not have accommodated such intrusive techniques associated with scientific methods. A much more restrictive safe frame would have been constructed that might prevent a researcher from utilizing such methods, from gathering useful data and from successfully conducting the study.
3. Indigenous practices may be at variance with scientific methods of determining cognition.
4. Insider/outsider limitations mentioned earlier could have acted as a barrier to utilizing an intrusive scientific technique.

In such cases, alternative approaches to cross-cultural movements may be useful. One instance of an alternative approach is the indirect behavioral method.

Snowden, Craig, & Gray (2011) describe indirect behavioral method of determining cognition in cases where direct scientific methods are inappropriate. They argued that some social cases might prevent research participants from speaking about themselves or providing data about their social behaviour. Sometimes participants might not be aware of the information required, might not have “insight into their behaviours” or might be tempted to “impression manage” the information they provide, thus affecting the quality of the data collected. The researchers argued that indirect methods that “do not require an explicit response from participants, yet still reveal reliable information about underlying cognitions may [...] be preferable” (2011, p. 193).

This indirect method suggests that the researcher retrieves the required data based on inference that is gathered from the responses of other participants. The researcher would then

utilize this data instead of data gathered through direct response from direct methods of inquiry. As an example, they suggested that participants' attitude towards themselves could be inferred rather than captured as an assessment of explicit behaviour. Ideally, a benchmark of the participant's cognitive state in the beginning and the consequent cognitive movements could have been ascertained using scientific methods described above. But for the reasons aforementioned, an implicit indirect method was more applicable to this study instead.

This study, therefore did not utilize scientific methods for assessing cognitive growth. Rather, it utilized the indirect behavioral approach to determine changes in lateral cognitive movement from one cultural learning domain to another. Cognitive movement was inferred from the participant's awareness of their Indigenous cultural positionalities and how these were described in relation to Eurocentric methods. For instance, a participant would have made some changes in lateral cognition from a Eurocentric to an Indigenous domain when they expressed knowledge of a cultural value in relation to, or contrasted against a Eurocentric one, and vice versa. This process is described in more details in chapter 3.

1.9.8 Chapter Summary

In this chapter, I have provided the research overview describing why the study was important. In the face of many development projects, especially those concerned with the deployment of digital technology for learning in Indigenous communities, more than just their implementation is required. Administrators and educators ought to encourage and explore cognitive gains and movements that would facilitate transitions between Eurocentric methods, and cultural and Indigenous ways of learning, and vice versa. More thoughts into such shifts are required in future research locations such as in Bunibonibee Cree Nation where post-secondary institutions have a mandate to reach. It should not only be about learning with technology, but

also about doing so in a culturally sensitive and collaborative manner. As this study has shown, this approach provided benefits to the community, and could provide benefits to future research conducted in similar contexts.

Initiatives contained in the *Digital Canada 150* document to connect 98% of Canadians by 2017 provided the underlying infrastructural benchmark for this type of development. But the present infrastructural system is insufficient to do so. As a result short to immediate term strategies are required to achieve this objective that will produce long term economic, social and cultural impacts on Indigenous northern communities. Aspirations to meet this objective will determine the extent to which Indigenous community members would be willing to utilize digital technology.

Because access to the internet alone was not sufficient, I framed the research purpose to focus on cognitive movements, which transcended the mere implementations of learning technologies for the purposes of narrowing digital divides, addressing social, economic and political concerns, integrating, and connecting schools; which has been the focus of previous studies on learning with digital technology in Indigenous communities.

The study used the Mobile Technology Mediated Adaptive Orienteering Framework (MTMAOF) as an initial conceptual tool for gathering and analyzing the data. Through a grounded theory approach, a refined framework, the Techno-culture Adaptive Framework was produced that could help educators and learners to develop Indigenous culture-centric pedagogies for learning with digital technology.

The research limitations and delimitations of the study described in this chapter examined the perspective of insider/outsider research. It highlighted the similarities between my African Indigenous traditional context and those of the community in which this study was conducted. I

described the process of gaining access to the community and presented a useful framework that guided my access to the community.

Chapter 2 presents a review of literature by exploring the trends that influenced Canadian post-secondary education. The Canadian post-secondary system and the evolution of technical and vocational education as an influence on Indigenous education are also discussed. The chapter explores the importance of digital technology in this context. Finally, it describes cognitive impacts in a context where technology has been introduced.

In Chapter 3, the research methodology, method and the research context are described in details. The University College of the North's center at the Bunibonibee Cree Nation hosts a technology facility that allowed University College of the North's students to actively engage in their learning. This set up was burdened by challenges including a lack of robust internet access and suitable mobile connectivity that could sustain learning, along with personal, community and cultural factors; and other policy, economic and social challenges. The chapter also describes the research objectives, research questions and phenomenology as the overarching methodology of the research. Narrative inquiry is further described as a method of analysis that allowed the researcher to ethnographically collaborate with the research participants.

Chapter 4 presents the research data and findings, highlighting four critical themes resulting from analyzing the research data. These themes lead to the sets of determinants, which are presented in chapter 5. Future research recommendations are presented in chapter 6.

CHAPTER 2: LITERATURE REVIEW

This chapter presents a review of literature describing global and local trends and their influences on Canadian post-secondary education. It describes the Canadian post-secondary system as a complex arrangement of institutions and governments that grant credentials. Government drives financial commitments to post-secondary institutions and with these commitments they set the research agenda and define a model of relationship that involve them, post-secondary institutions and industries. Technical and vocational education is one model. Historically, technical and vocational education was a vehicle for social mobility. Today it is integral to the growth of Canada's economy. For example post secondary programs have been adapted to meet the needs of Indigenous peoples. Red River College, a Manitoba college, offers programming that support Indigenous student success (RRC, 2017). The University College of the North, which was a technical vocation college but is now a university, delivers programs specifically to students in northern Indigenous communities.

2.1 Global Post-secondary Trends

There are many factors that have characterized global post-secondary trends in recent times. Some of them include but are not limited to funding influences on what may be termed priority areas, the quality and agenda of research (Jacob & Gokbel, 2016) and the global movement of students and faculty from one part of the world to another (Altbach, Reisberg, & Rumbley, 2009). Other factors include the increasing demand for diversity, multiculturalism and multicultural education (Boyadzhieva, 2015). The growing numbers of students and faculty which is often described as massification (Altbach et al., 2009; Jacob & Gokbel, 2016) and the increasing demands for quality assurance and for accountability of education credentials are other important major trends in global post-secondary.

Funding is perhaps one of the most significant factors affecting global post-secondary education. The availability of funding sources determine the movement of students from one location to another who do so to avoid rising tuition costs (Jacob & Gokbel, 2016). Government priority on funding, most of which is linked to economic development often demand stronger collaborative ties between industry and post-secondary institutions (Jacob & Gokbel, 2016; Logan & Curry, 2015). As a result, government funding is likely to be tied to research priorities. This arrangement changes the role of government from an independent funding source to a regulator responsible for shaping educational policy. Post-secondary institutions have had to adapt to meet the demands of government and of industry. Some of these demands have a more global than a local focus. Consequently, learners and faculty tend to move towards institutions whose credentials are globally recognized (Logan & Curry, 2015) thus creating inequalities among groups of students, faculties and institutions who cannot participate in this space.

There are parts of the world “that do not have access to quality higher education opportunities” (Jacob & Gokbel, 2016, p. 4). Institutions that can afford them set up remote campuses, some of which may be in other countries. Countries that could support their institutions contribute to a global movement of students by creating immigration policies that attract foreign students to the schools in their countries. Australia seems to attract more undergraduate students at 24.3% compared to 7.6% presently enrolled in the United States (Marginson, 2017). Some international students return to their home countries upon graduation but a lot more choose to remain to meet their host country’s demands for qualified and skilled labour (Jacob & Gokbel, 2016).

Constant revision of curricula is required to keep pace with employment demands (Altbach et al., 2009; Chu, Reynolds, Tavares, Notari, & Lee, 2017; Huang & Price, 2016; Jacob

& Gokbel, 2016). Industry and government seems to apply pressure on post-secondary institutions to produce students with skills that can meet the demands of the workplace. This has consequently led to demands for new ways of teaching and learning, some of which includes knowledge of digital media, digital technology and mobile technology (Chu et al., 2017; Huang & Price, 2016). Graduates of post-secondary institutions are expected to be skilled in new ways of thinking, new ways of working, have new tools for working and have skills for living in the world (Chu et al., 2017). Graduates are also expected to be able to think more analytically, to have digital and sophisticated communication skills and to be able to exhibit knowledge of innovative thinking and digital literacies.

The proliferation of massive open online courses (MOOCs) and other forms of learning through digital technology have highlighted the need for these kinds of skills. Students are expected to develop self-directed learner-centered skills with these forms of learning (Jacob & Gokbel, 2016; Logan & Curry, 2015).

Arguably, the push from industry and from socio-economic factors continue to influence the shape of global post-secondary education (Cuban, 2003). The forces of demand and supply cannot be excluded from global post-secondary education. Market demands for more students and instructors had contributed to knowledge flows from the global north to the global south (Appadurai, 2006) with a commensurate exchange of intellectual property, faculty, skilled labour, literacies and knowledge from the global south to the north (Brydon, 2012). These developments call for new definitions and conceptualizations of ideas, philosophies and concepts that recognize funding priorities, the changing cultural landscape of the academy and the influences of technology on learning.

Our world is inter-connected, not only by wires and cables but also by business practices, global trades and economic influences. Social and cultural linkages and political/governmental desires for a standard system of global governance also continue to shape our world. Perhaps, the aim for most countries or groups of countries is to establish a common language of communication, to transact using a common currency, and to maintain ascendancy as necessary. As a consequence, spatial geographies seem to narrow while epistemological distances seem to widen. The English language continues to dominate business and education amidst the increasing influences and fluidity of digital technology (Altbach et al., 2009). Growing inequalities appear to delineate one culture from another.

Within this global landscape, certain geographic regions hegemonize their knowledge or advance a stronger front in the race for academic supremacy. The European Union Bologna Process and the Lisbon Strategy (Brydon, 2010) are examples that produce strong centers and weak peripheries that appear to further fragment equality in global post-secondary education (Altbach et al., 2009). Knowledge of the English language, access to research funds and the ability to conduct research or produce knowledge are the legal tender for advancing from the peripheries to the center.

Countries like the United Kingdom have removed “research only” designations from specific universities allowing all institutions to conduct research and offer doctoral programs (Marginson, 2017). Regions of the world especially those of the global south where capital is scarce are extremely disadvantaged (Altbach et al., 2009, p. vi). Internal fragmentations are similarly visible between the rich and the often marginalized, usually within the same boundaries, somewhat similar to the northern and southern divide in the Manitoba/Canadian context.

2.2 Post-Secondary Trends in Canada

Canada is not absolved from these kinds of global trends. The post-secondary system in Canada is a complex arrangement of various stakeholders. It consists of public and private colleges and universities, government and the governance arrangements between them (Smith, 2011, pp. 48–49). Post-secondary institutions in Canada are certificate, diploma, undergraduate, masters and doctorate degree granting institutions (STATSCAN, 2010).

Canada's political structure as a constitutional monarchy and parliamentary democracy has shaped the Canadian post-secondary landscape since the mid-1800s. This has resulted in the sharing of jurisdiction between the federal government and its ten provincial and three territorial governments (Shanahan & Jones, 2007). Etched in the Constitution Acts of 1867, the federal government relinquished legislative, administrative and coordinating powers to the provinces for post-secondary education. It maintained jurisdictions over certain national programs and initiatives such as those related to defense, economic development. The Indian Act of 1876 provided the initial reference to the "education of Indians" (Atleo, 1989, p. 3). This Act made the education of Indigenous people the responsibility of the federal government. The residential school system, later discussed in this chapter, was a result of this policy.

Federal oversight was required to provide direct control over vocational and technical training. This control was strongly linked to national economic priorities that were meant to prepare Canada for the global economy. Presently the Human Resources and Skills Development Canada (HSRDC) is a federal government department that collaborates with the provinces to provide oversight of community college skills training programs. Universities define their own programs.

At the universities, research and development is closely linked to Canada's economic development because federal government support defines the agenda. Even though private sector funding and collaborative research relationships between them and universities have continued to grow, a large proportion of university-based research funds still come from the federal government (Collin & Thompson, 2010; D. Fisher et al., 2006; Rasmussen, 2008).

The focus of federal and provincial governments has been to increase Canadian competitiveness in the global knowledge economy. Education is vital to achieving this objective (CFS, 2013, p. 1). The economy, war and demography are some of the other influences that have shaped Canadian post-secondary education (Fisher et al., 2006) in the last two centuries but globalizing forces also contribute to the outlook of post-secondary education. Movement of researchers, students and faculties from one part of the world to another are some of the other trends that have shaped education in Canada.

Post-secondary participation rates in Canada are quite high at 55% compared to other OECD countries at 33% for those aged between 25 and 34 (CCL, 2009) but abysmal between internal demographic groups such as low income families and Aboriginal students. Students from families earning less than \$75,000 per year are less likely to enroll in universities than in colleges, thus raising a concern about affluence and university access for certain Canadians including Indigenous students (CCL, 2009). University education is likely more accessible to students whose parents attended universities (CCL, 2009). Students from low-income families and Aboriginal students, whose parents are less likely to have attended post-secondary institutions, fall into this category. Certain funding strategies and programs have been defined to address these concerns, albeit with variable outcomes.

2.3 Trends in Indigenous Post-Secondary Education

Technical and vocational education, in the form of secondary industries and trade schools, were established in the 1700s. Social education at this time was a bourgeois activity, a vehicle for social mobility, intellectual liberation and for the creation of ideal “submissive workers” (Lyons, Randhawa, & Paulson, 1991). The outcome of lobbyists’ interventions concerning the length of post-secondary schooling produced high schools that focused on practical courses and reduced the length of time students spent in school. Ontario’s act in 1871 later replaced these schools with university preparatory collegiate institutions and high schools for commercial subjects. In the mean time, special interest lobby groups led by the Canadian Manufacturers Association pressured the federal government for more support for vocational education in order to compete with other industrialized states and to meet the needs for skilled workers in Canada (1991, p. 140).

The acts and policies of the 1800s determined the shape of Indigenous education, even though settler state Indigenous education dated further back than the Indian and INAC acts. Federal involvement in Indigenous education ran simultaneously with labour force and vocational training pursuits of the 1870s. At this time, nation-building priorities were tied to usurping Indigenous lands, establishing reserves and linking national railway and communication systems. The assimilationists of the Dominion of Canada did not recognize Indigenous ways of knowing and learning, neither did they reflect on Indigenous education needs from an equity perspective. They did not acknowledge local community structures of Indigenous people and how these structures influenced learning. Federal and provincial government nonetheless went on to establish education initiatives for and on behalf of Indigenous people.

Schools specifically addressing Indigenous education needs emerged in 1879 with Emmanuel College in the Northwest Territories (now called Saskatchewan) to train Aboriginal

catechists, teachers and interpreters (2006, pp. 9–11). The college became degree granting in 1881 and was incorporated into the University of Saskatchewan in 1883. From 1908 the Department of Indian Affairs increased funding to raise the number of Aboriginal college graduates. However, support was sporadic.

Ultimately, federal government policy began to connect vocational and technical education to national economic development with an aim to prepare a workforce to compete in the global economy (Fisher et al., 2006, p. 5). The Royal Commission on Industrial Training and Technical Education emerged in 1910 with the appointment of a federal labour minister William Lyon MacKenzie King and the creation of provincial grants for agricultural research and training (Fisher et al., 2006, p. 16; Lyons et al., 1991, p. 140).

Later, the Agricultural Aid Act, the Agricultural Instruction Act, the Technical Education Act were passed during World War I. The National Research Council provided grants for vocational and scientific research between 1913 and 1916. Alberta, Quebec, Ontario and Nova Scotia used these grants to establish agricultural colleges (Lyons et al., 1991). Funding to support vocational training of young people came with the Dominion-Provincial Youth program of 1937 later to become the Dominion-Provincial Student Aid Program (Fisher et al., 2006, p. 18). These had varying results, one of which was that students received more support from provincial sources than from federal programs.

But the depressions of the 1930s began to cripple these efforts and to question beliefs in higher education as a liberating force and a catalyst for success in the job market (Lyons et al., 1991, p. 142). Saskatchewan modified its Secondary School Education Act to enable vocational education in 1938. During World War II the Vocational Training Coordination Act of 1942 was established to provide programs to servicemen, veterans, the unemployed and industrial

supervisors (Lyons et al., 1991, p. 142). The Vocational Schools Assistance Agreement of 1945 was a cost-sharing arrangement between federal and provincial departments that went towards the creation of provincial high schools. To respond to demands for highly skilled people, the federal government opened its doors to Europe as a source of skilled workers.

With the institution of the Technical and Vocational Training Assistance Act (TVTA) of 1960, the federal government made a strong foray into directly supporting technical and vocational education including the training of technical vocational teachers (Fisher et al., 2006; Lyons et al., 1991). The TVTA had links to previous (un)employment insurance arrangements and was focused on the “training of workers to meet technological and industrial changes” (Fisher et al., 2006, p. 19). Federal-provincial projects were funded with over \$1.5 billion resulting in the creation of provincial technical and vocational institutions that offered trade education.

Most scholarship supports from 1957 to 1963 were tied to technical and agricultural post-secondary education. Attempts to terminate Indian status, to dismantle Indian Affairs and to transfer Aboriginal education to the provinces by Indigenous peoples were met with a lack of support from the federal government. The federal government withdrew its support to technical vocational training in 1966 with an announcement that it would rather support “adult occupational training and retraining, and...increase its assistance to universities” (Lyons et al., 1991, p. 143). The government also launched the Adult Occupational Training Act only to replace it later with the National Training Act of 1982, when the previous act failed to meet the growing demand for skilled workers. It also failed to provide Canada with a competitive edge among its peers.

By 1972, the Assembly of First Nations (formerly National Indian Brotherhood) put forward policy directions for Aboriginal control of Aboriginal education. Manitou Community College opened its doors in 1973 as the first Aboriginal controlled post-secondary institution.

Saskatchewan Indian Federated College was created in 1975 and the Gabriel Dumont Institute of Native Studies and Applied Research was later established as a non-profit in 1980. Federal support in the form of hassle-free entry requirements for Aboriginal students was lacking until 1977 when a new funding program was put in place.

With the introduction of the Canadian Job Strategies in 1985, federal focus shifted from provincial community colleges to the privatization of training, a move that centered industries in decision making concerning federal training priorities (Fisher et al., 2006, p. 101). This shift influenced the move for more equitable employment targets and pre-employment education for women, natives, the disabled and visible minorities (Lyons et al., 1991, p. 144). Subsequently, Aboriginal-controlled community learning centers and non-profit institutions emerged to provide credit- and non-credit vocational training. As demand for highly skilled workers increased, federal and provincial strategies began to change to include the retraining of minorities and women. The strategies focused on the establishment of better collaboration and cooperation between government and industries in order to increase worker mobility across provinces. The strategies also led to the creation of interprovincial certification and recognition and they helped to improve accountability through program evaluations.

In the past, students benefited from federal sources of income channeled through the former Canada Student Loan Program and now through the HRSDC's Canada Millennium Scholarship Foundation. First Nations students were funded through the 1977 Post-secondary Assistance Program, then through the 1983 University and College Entrance Preparation Program and then the 1989 Post-secondary Student Assistance Program. Most recently, the Post-Secondary Student Support Program was administered by the Indigenous and Northern Affairs Canada up to

the tune of \$322 million in the 2013-14 year. This fund supported over 22,000 students allowing each student variable funding up to a maximum of \$35,000 per year (INAC, 2015).

Aboriginal students post-secondary participation and completion rates are improving, following the most recently available Statistics Canada data dated 2011 (STATSCAN, 2016).

Aboriginal people aged from 25 to 64 with a post-secondary qualification is at 48.4% compared to 64.7% of non-Aboriginal students. This number is up by nearly 6% in 5 years. Those with a:

- A trades certificate is 14.4% compared with 12% of non-Aboriginal students.
- A college diploma is 20.6% of Aboriginal students compared with 21.3% of non-Aboriginal students.
- A university certificate below a bachelor level is 3.5% compared with 4.9% of non-Aboriginal students.
- A university degree is 9.8% compared 26.5% of non-Aboriginal students.

Aboriginal students represent about 3 to 4% of the undergraduate student population in Canadian universities and colleges (AUCC, 2011, p. 19). Only “8.7% of First Nations people, 5.1% of Inuit and 11.7% of Metis have a university degree, according to the 2011 census” (TRC, 2015, p. 199).

Younger Aboriginals in the 35 to 44-age bracket have proportionally higher levels of education at 68% than their counterparts in the 55 to 64-age bracket at 58.7%. Younger Aboriginal women have 13.6% compared with 10.2% of their older counterparts with a university degree (see Table 2).

Table 2: Proportion of Aboriginal People by Selected Levels of Educational Attainment, Sex and Age Groups, Canada 2011

Selected levels of educational attainment	Aboriginal women		Aboriginal men	
	35 to 44 years	55 to 64 years	35 to 44 years	55 to 64 years
	Percentage			
Postsecondary qualifications	55.3	46.5	48.0	47.1
Trades certificate	9.9	10.1	19.3	22.3
College diploma	27.1	21.4	18.3	14.1
University certificate below bachelor	4.6	4.8	2.7	3.2
University degree	13.6	10.2	7.6	7.6

Note. Table 2. Proportion of Aboriginal People by Selected Levels of Educational Attainment, Sex and Age Groups, Canada 2011. Retrieved from <https://www12.statcan.gc.ca/nhs-enm/2011/as-sa/99-012-x/2011003/tbl/tbl1-eng.cfm>

While federal and provincial governments have set up structures such as student loan schemes and financial aid programs to address participation rates of low income students, this demographic is less likely to be aware of their availability and to utilize them.

2.4 The Residential School System

Gaps in Indigenous education continue to persist despite improving numbers. The vestiges of the residential school system might have affected this trend. Aboriginal and Inuit education was made the responsibility of the federal government by the Indian Act and later by the Canadian Constitution Act of 1982. The Department of Indian and Northern Affairs Canada (INAC) began to oversee the education of Metis and non-status Indians and to undo many years of the assimilation of “Aboriginal people(s) into the lower strata of the dominant society often brutally and without regard for local culture, language, traditions and values” (Fisher et al., 2006, p. 4).

In the 1950s the federal government began to operate its own schools. In the 1960s attempts were made to integrate Indian children into provincial school systems. Since the 1970s Aboriginals have struggled to assert jurisdiction over their own education within their claim of self-government. By 1973 the federal government accepted local control of education (Fisher et al., 2006, p. 4).

Indian residential schools are perhaps one of the most damaging tools of imperialism (Battiste, 2005). Framed as a solution to a so called Indian problem, residential or boarding schools were created to educate Indigenous people, eliminate communities and to dominate them through carefully crafted policies (Woolford, 2015). The presence of these schools declared Indigenous people as “unfit parents”, savage and brutal (TRC, 2015, p. 4). Residential schools were designed to undermine Indigenous ways of learning and knowing.

The 2015 Truth and Reconciliation Commission report described the operation of residential schools as “cultural genocide” and,

the destruction of those structures and practices that allow the group to continue as a group. States that engage in cultural genocide set out to destroy the political and social institutions of the targeted group. Land is seized, and populations are forcibly transferred and their movement is restricted. Languages are banned. Spiritual leaders are persecuted, spiritual practices are forbidden, and objects of spiritual value are confiscated and destroyed. And, most significantly to the issue at hand, families are disrupted to prevent the transmission of cultural values and identity from one generation to the next (TRC, 2015, p. 1).

The Truth and Reconciliation Commission report describes stories of people, once children who were separated from their parents and placed in residential schools, “not to educate them, but primarily to break their link to their culture and identity” (2015, p. 2). Eighty residential schools were created across the country and the last ones closed only recently in 1996 when the federal government’s policies of segregation began to give way to a policy of integration (Williamson, 2011). The Truth and Reconciliation Commission report suggested that there remain

significant obstacles to access to post-secondary education even for those who qualify from Indigenous communities.

Several calls to action emerged from the Truth and Reconciliation Commission report. Among them was the call on the “federal government to provide adequate funding to end the backlog of First Nations students seeking a post-secondary education” (2015, p. 199). The report recognized the need for funding to address educational gaps such as the role of digital technology in the delivery of good quality education,

The funding formula for First Nations schools was last updated in 1996, and does not take into account the range of basic and contemporary education components needed to deliver a good-quality education in the twenty-first century, such as information and communications technologies, sports and recreation, language proficiency, and library services (TRC, 2015, p. 196).

In relation to digital technology, Call 54 of the TRC report appeared to make reference to the provision of financial resources about technical inputs in support of an endowment of a National Reconciliation Trust:

We call upon the Government of Canada to provide multi-year funding for the National Council for Reconciliation to ensure that it has the financial, human, and technical resources required to conduct its work, including the endowment of a National Reconciliation Trust to advance the cause of reconciliation (TRC, 2015, p. 274).

The recognition of digital technology in the TRC’s report and the establishment of a Trust Fund that may address technical resources are important calls for actions, but they are not specific enough to strongly emphasize the need for digital technology specifically for Indigenous education.

2.5 Creating an Indigenous Post-Secondary Institution

Post-secondary education in Canada has most often been developed in the urban centers, mainly in the southern parts of the country. Northern expectations for post-secondary education have historically been low. Steps were taken by federal and provincial governments to address these gaps. In Manitoba, the Northern Manitoba Vocational Center was created in The Pas and Thompson in the 1960s. Keewatin Community College was created in 1966. These institutions were established to provide vocational training in Indigenous communities. They were linked to resource extraction industries in these communities (Morrison, 2014).

Aspirations of northern Manitobans for a university came to a head in the late 1990s, particularly in 2000 when Manitoba Keewatinowi Okimakanak (MKO) made the case for the establishment of the University College of the North in the proposal titled: “University College of the North: A Vision for Our Future”. For over fifteen years of dialogue, not much progress was made towards the creation of the university (Kirkness, 2003).

Beyond the underlying challenges of improving and increasing the success rates of northern students enrolled in northern university programs, the university was intended to expand program options to meet current and projected needs of the north. It was meant to contribute to building a stronger northern community and to strengthening the economic benefits accruable to it (MKO, 2000, p. 3).

Digital technology was meant to play a significant role in ensuring that the university was able to extend learning to remote communities in northern Manitoba. This role is reflected in the Recommendations and Action Plan report for the creation of the university in which Kirkness (2003, p. 9) argued that the University College of the North would be a “vehicle for expressing

and addressing economic aspirations and development...[and technology would be used to plug]...the black hole that exists in the north” (2003, p. 9, Kirkness quoting Rebecca Ross).

Digital technology was intended as the means to provide “the widest possible range of programing...and the glue that can hold a far-flung operation together” (2003, p. 17). There were obvious beliefs that digital technology used for education has the potential to transform the lives of the people living in the north. Although simply installing and implementing digital technology alone is not sufficient to make this happen. Less obvious factors such as the acceptance of the technology by the community members is equally critical for digital technology’s success in the community (Akoh, 2012b; Mishler, Polkinghorne, Lieblich, Clandinin, & Murphy, 2014; Venkatesh, Thong, & Xu, 2012).

Traditional practices could be linked to digital technology and digital technology could be used to extend the capabilities of traditional practices. As Martin Heidegger and Marshall McLuhan put it, technology is an extension of being and of essence (Heidegger, 2007; McLuhan, 1994). Mignone & Henley (2009) identify technology as social capital and an important determinant for health in traditional Indigenous communities. Their descriptions of technological extensions came from a place of traditional practice. In this form, they straddle multiple worlds, much in the same way as Atleo describes the technological extension of her hand through the use of the *chitulth* (fish knife). Here, she projects herself from her world into the lived experience of her teacher’s world, and back again (Kawalilak & Groen, 2014).

Projects such as those in *Mangochi*, a community in Malawi (Akoh et al., 2012) permit community members to leverage the benefits of technology and science, and to project these into their community practices; especially when they are allowed to take ownership of the technology-based project, to engage cognitively in its design and to recognize traditional and cultural

practices in its implementation. These projects then engender the ability to shift between cultures mediated by technology thereby producing outcomes that have the potential to accrue positively across generations.

2.6 Digital Technologies in Post-Secondary Education

Digital technology have been experimented in post-secondary education for a long time (Akoh, 2012b; Pegrum, Oakley, & Faulkner, 2013). Email communication (Carpenter, 2004), distance education (Youn, 2001), online learning management systems (Tan, Liu, & Burkle, 2013), open education resources (Siemens, 2008), learning using mobile devices (Utulu & Alonge, 2012), social media (LeNoue, Hall, & Eighmy, 2011) and new forms of mass content delivery such as Massive Open Online Courses (MOOCs) (Traxler, 2013) permeate the post-secondary landscape. The implementation of digital technology has both solved old problems and created new ones.

Traditional universities in collaboration with private sector technology institutions contribute to the burgeoning online space for content. By no means all, initiatives such as iTunesU and Coursera have instigated new and open models for generating revenue; education happens to be a byproduct. These models arguably have had economic and political impacts on traditional brick and mortar institutions, as they do on virtual and online universities (Ingolfsdottir, 2016).

It is ironic that technology as a double-edged sword provides broad-based access to more students while simultaneously restricting it to those who might need it most, i.e. those for whom cost makes it prohibitive or for whom internet infrastructure remains a challenge. Students from the global south or those in Indigenous communities in northern Manitoba are likely unable to access content on Coursera and iTunesU because of their poor and often expensive internet

connection. Although connectivity is improving, the low level of connectivity remains the same in Bunibonibee Cree Nation and in other Indigenous communities across northern Manitoba.

Historically, broadcast media such as radio and then later television have been used for learning. They have helped to provide alternatives to place-based learning. This form of learning was often unidirectional. It was not until radio call-in programs allowed targeted audiences to participate more actively in the learning process that these media truly provided some form of interaction. With the growth of the internet, platforms for learning have moved from broadcast media to correspondence courses that allowed students to interact with their instructors and other students through emails, video or learning management systems. This was an improvement from the correspondence course era of the past that was delivered through surface mail. The internet has helped to improve the platforms for learning and academic institutions have taken advantage of these improvements to reach students well beyond their geographic boundaries.

Historically, learning was not conceived only as delivery. Hollingworth's (1932) dated article described learning as the need to reduce cues as we progressively relate cognitively to external stimulus. For instance, as novice drivers become more conversant with driving through repeated practice, and as they acquaint themselves more with road rules, they tend to progressively apply less of their senses to the actual practice of driving until a minimum required “sense” level is attained and maintained. According to Hollingworth, learning is said to have occurred when “the expedient degree of cue reduction has been achieved” (Hollingworth, 1932, p. 64). This brings up the question of whether the improvements that have been attained through digital technology do actually enhance learning.

Correspondences courses of the past and the delivery of content using internet technologies, emails and learning management systems, may produce the desired level of cue

reduction, but may not necessarily guarantee the presence of other learning strategies such as increased levels of interactions and social forms of cognitive engagement which Vygotskiï described (Vygotskiï, 1978). Learning encompasses many factors. Learning with digital technology encompasses many factors.

2.6.1 Digital Technology Definitions

The terms media and technology have been interchangeably used throughout this document to convey the same meaning even though they are actually different terms. It is however important to define these terms and to place them within the context of post-secondary education. A good starting point is to define technology

Definitions of technology range from the narrow (technology as device) to the broad (technology as system) to the all-encompassing (“If God didn’t invent it, then it is technology”) (Hlynka, 2013d, p. 300).

This leaves us feeling that everything is technology. The definition of technology is multifarious and often ambiguous. However, technology is the “application of science”, the “systematic study of the arts” or the “practical implementation of intelligence” (Hlynka, 2013a, p. 301). Technology is situated in a broad complex system of people and things, of “hardware, knowledge, inventors, operators, repair people, consumers, marketers, advertisers, government administrators and others” (Hlynka, 2013d, p. 301).

Technology is “a means [of] fulfill[ing] human purpose...an assemblage of practices and components...and...the collection of devices and engineering practices available to a culture” (2013b, p. 301). This all-encompassing definition is consistent with Carlson's (2007) description of technology as a means by which modern and postmodern societies apply themselves in the

pursuit of material abundance, social order and cultural meaning. This study is concerned with the broad application of technology for determining cultural meaning and relevance.

Terms such as learning technology, educational technology and media technology that are used to describe digital technology are often used interchangeably with “information and communication technologies (ICTs)”. Information and communication technologies describe “Information technology” as “technologies which contain, store, and disseminate information” (Hlynka, 2013c, p. 142) and communications technology as “technologies designed for short term communication” (2013c, p. 142). A common thread in these definitions is that technology, whether used in an educational sense, for information or for communication purposes, is a collection of complex systems efficiently utilized for facilitating learning or improving performance.

The effectiveness of learning with digital technology has been the subject of debates for many decades. The Clark versus Kozma debate, later described in this section, is an early discourse on the effectiveness of digital technology for learning. Perhaps to give context to the importance of digital technology in education and to explore its role as an important trend in Canadian education it is best to justify its appropriateness within whatever context it is implemented. Some historical context about digital technology’s use in schools may be necessary.

In a description of California’s Silicon Valley, Cuban (2003) traced digital technology’s history from the 18th century gold rush to the 20th century technology rush. He argued that modern technology companies were unafraid to pump large sums of money into education. This largesse resulted in misuse, misdirection and misguided interests displayed by educational institutions. These companies wanted rapid changes in educational policies and they strongly lobbied schools that could hardly resist the urge to pander to dangled carrots of large financial

investments for technology projects. Cuban called these projects “oversold and underused” (Cuban, 2003).

Educational technology emanated from the term *educational media*, which was a transition of terms from the more rudimentary *visual education* used in the 1920s, to the duality presented by *audio and visual education* made prominent in the 1940s. The term transitioned to *educational media* in the 1950s and then to *educational technology* in the 1970s, and more recently, *learning technology*. These definitions of educational technologies centered on the media, medium, tools and processes involved with their use in learning. Hlynka described media and medium to be synonymous with technology but distinguished between them by delimiting media (plural) to “the tool or product” and suggesting medium (singular) to have “a broader process/product/systems focus”. Hlynka’s definition is idealistically similar to Laurillard’s definition of media to mean technology that supports learning activities through its narrative, interactive, adaptive, communicative and productive attributes (Hlynka, 2013a). The definitions of these attributes were and continue to remain contentious (TECFA, 2012).

2.6.2 Implications of Technology on Learning

The debate in support of or against educational technology’s use for learning goes beyond the nomenclature. It transcends the “what” that concerns the impacts that certain inherent attributes that that technology has on learning outcomes. It supersedes the narrow “device” paradigm associated with technology as a tool, to a “systems” paradigm captured by a complex interrelation of procedures, people, processes and tools that is intrinsic to human purpose, practice and culture (Hlynka, 2013c). Conceptualizing educational technology as a system provides new complexities requiring further discourse.

The Clark/Kozma debates was one in which these complexities became glaring. McLuhan's "medium is the message" philosophy set the context for this debate.

Media or technology and its inherent message or power is a strong force with overpowering capabilities. Media and its message are indistinguishably whole. McLuhan described it as an "extensions of man – the technological simulation of consciousness, when the creative process of knowing will collectively and corporately be extended to the whole of human society" (McLuhan, 1994, pp. 3–4). The medium and the message are whole and inseparable. McLuhan describes this wholeness in the following way:

Whether the light is being used for brain surgery or night baseball is a matter of indifference. It could be argued that these activities are in some way the "content" of the electric light, since they could not exist without the electric light. This fact merely underlines the point that "the medium is the message" because it is the medium that shapes and controls the scale and form of human association and action. The content or uses of such media are as diverse as they are ineffectual in shaping the form of human association. Indeed, it is only too typical that the "content" of any medium blinds us to the character of the medium. It is only today that industries have become aware of the various kinds of business in which they are engaged. [...] The electric light escapes attention as a communication medium just because it has no "content." And this makes it an invaluable instance of how people fail to study media at all. For it is not till the electric light is used to spell out some brand name that it is noticed as a medium. Then it is not the light but the "content" (or what is really another medium) that is noticed. (pp. 8-9).

It is in understanding this force of media that mastery generates the self-power to stand aside or to take charge in order to avoid or control the imposing force of any medium on our own

assumptions (p.15). Thus, the Kozma/Clark debates were about the force that media wields whether wholesome or in parts.

Clark argued that the media is “merely a vehicle” that conveys its message. The message makes meaning. The medium of transmission has little or no influence except for its attributes, two of which are:

1. Its cost-effectiveness, the extent to which the media is affordable.
2. Its replaceability, the extent to which another media could effectively convey the same message.

Clark suggested that the careful consideration of both attributes should be a guide to the implementation of an educational technology project.

On the contrary, Kozma did not limit media to these two attributes only, but chose instead to extend it to include its functions and capabilities, or its “affordance” (Akoh, 2012). These three elements described Kozma’s portrayal of technology’s functions and capabilities (TECFA, 2012):

1. Tangibility, i.e. is the technology physical, or electrical?
2. Symbolic systems, i.e. is the technology’s medium of communication in compliance with certain rules and conventions, is it printed text, images, numbers or musical scores?
3. Procession capabilities, i.e. is the technology’s function either for storage, displaying or retrieval, etc.?

It is important to state that both Clark and Kozma agreed that “instructional methods...account for learning gains” (Clark, 1986, p. 24). The argument is whether or not this results from the application of technology. To better understand these arguments, we must clarify

Clark's positions. Clark argued for separation a) of technology from its sets of attributes, b) of instructional technology from instructional methods.

The central question in Clark's argument for the separation of media from its sets of attributes is, can any other medium [or technology] produce a similar set of attributes leading to the same learning outcome (1986, p. 28)? Clark claimed that if two different but similar media (or technology) could produce the same learning outcomes then it is the method of application of that technology that was causal to the outcome and not the choice of media or technology used. If this is so, then Clark's second argument, which argued for the separation of the technology from its method of application claimed that:

Our failure to separate medium from method has caused enormous confounding and waste in a very important and expensive research area. We continue to invest heavily in expensive media in the hope that they will produce gains in learning. When learning gains are found, we attribute them to the delivery medium, not to the active ingredient in instruction. When learning gains are absent, we assume we have chosen the wrong mix of media. In any event, many educators and business trainers are convinced that they must invest scarce resources in newer media in order to insure learning, performance or motivational gains (Clark, 1986, pp. 26–27).

Clark argued that the shifting of blame from technology to its method of application depending on its outcome – positive or negative, does not permit us to evaluate the effect of the media directly. The assumption that the media or the method is to be blamed for its failure is rather too simplistic.

Clark's argument carries some weight in the light of current educational budgetary constraints across Canada and globally where investment decisions have to be made for or against

educational technology implementation. By inference, it may not be difficult to see the other side of this argument though, which is that appropriately implemented technology could help reduce the cost of school administration, student registration processes and overall management cost/overheads. It could produce positive outcomes and new roles for people, “which is to say [that it could enhance the] depth of involvement in their work and human association that our preceding mechanical technology had destroyed” (McLuhan, 1994, p. 7). Ultimately, any technology applied to a context is like a double-edged sword (Burke & Ornstein, 1995; McGrail, 2006) – it creates new challenges and opportunities with every old concern it addresses. Thus it is easier to base a decision for the use of technology purely from an economic perspective and to worry less about its bearing on cognition, teaching and learning. A bias towards this position results in lost jobs, reduced faculty and administrative staff and a different model in education management. Consequently, new roles emergence and positions and lifestyles (McLuhan, 1994, p. 7) are adjusted to the detriment of actual learning.

Arguably, both Clark and Kozma are consistent with the fact that any media or technology possesses certain pieces of functionality and capability that could have an impact on a specific context, situation or challenge. When applied in a learning context, it should produce learning cognition. Its application should however be based on its cost effectiveness or replaceability. These attributes and elements define what may best be described as inherent bias in the media or technology, which is described later in this chapter.

It is important however to comment on the “affordance” or the action potential of that technology (Greeno, 1994). Not all technology is appropriate for all specific applications. Some technologies are more effective than others, the same way a hammer is more appropriate for driving a nail into a wall than is a screwdriver. The appropriateness of any educational technology

is tied to its replaceability factor and ultimately, its cost effectiveness. If another educational technology can produce the highest possible learning outcome, it can arguably be said to have the most affordance. Thus, an important consideration facing the implementation of educational technology in Canadian schools today and to First Nations communities specifically should lie not merely with its attributes but with its possibility to produce the highest influential affordance (TECFA, 2012).

Digital technology such as mobile devices and the internet have been transformative in many aspects of life. Regardless of their positive or negative outcome, they have changed the way we communicate, led to increased access to information and to knowledge and have transformed our ability to search and retrieve information.

Digital technology has also influenced the structures of governance and the forms of engagement between government and its people. It has shaped government policies and defined national strategic directions. One such example is the Government of Canada's *Digital Canada 150* document, which described the government's digital strategic priorities for economic growth and development. The strategy emphasized the improvement of access and the lowering of bandwidth cost to all Canadians including those in remote communities. Lowering the cost of mobile telephony was a significant action plan of the previous Prime Minister Stephen Harper's administration, which lasted from 2006 to 2015. It remained the focus of the Prime Minister Justin Trudeau's administration under which \$4.2 million funding has been provided to bring high speed internet to all First Nations communities in Manitoba (Jillian Taylor, 2016).

Digital technology, such as the internet and mobile devices are in fact a double-edged sword; one side is applied to address a challenge and the other side creates unintended problems with consequence. Souter, Maclean, Akoh, & Creech (2010) define these consequences as the

“systemic effects” of technology on society. Systemic effects produce rebound effects, uncertainties and unforeseen events. For instance, the rebound effect of having a smart mobile device is better bandwidth, which in turn is the requirement for large infrastructure, which in turn require more resources, and so on. The application of one piece of technology produces so many rebounds. These rebounds affect various aspects of society.

Uncertainties and unforeseen events that technology may produce could include new kinds of threats and vulnerabilities to human and natural systems (2010, p. 26). The recent ransomware cases are examples of threats and vulnerabilities that could have damaging impacts on our systems which may in turn affect social and economic ongoing (CBC, 2017). The impact of uncertainties and unforeseen events on society is what McLuhan questioned (McLuhan & McLuhan, 1988) when he asked:

- a) What does the digital technology enhance or intensify?
- b) What does it render obsolete or displace?
- c) What does it retrieve that was previously obsolesced?
- d) What does it produce or become when pressed to an extreme?

These questions, called the laws of media, are relevant in analyzing and examining the impact of digital technology on society today. When these questions are posed to the use of digital technology in an Indigenous learning environments, they may appear somewhat as follows:

- a) What aspect of the culture does the digital technology enhance or intensify?
- b) What aspect of Indigenous culture is rendered obsolete or displace by the digital technology?
- c) What would the digital technology retrieve that was previously deemed obsolescent?
- d) What would the digital technology produce or become when it is pushed to an extreme?

Responses to these questions are consistent with the systemic or rebound effects described earlier. These effects have long-term impacts on the society in which the digital technology is implemented because they could fundamentally transform existing cultures and shape Indigenous practices. These effects are further discussed in chapter 5.

2.6.3 Learning Technologies in the Canadian Post-Secondary Context

A number of critical factors determine the appropriateness and the utility of digital technology for learning. Studies conducted in the early days by the Canadian Collaboration for Online Higher Education and Research (COHERE) suggested that social factors, which are non-technical in nature such as effective management and administration, are equally important for successful implementation of digital technology for learning. In the area of distance and online education where digital technology has been extensively experimented, some digital technology proponents at COHERE had argued that certain digital technology should be complemented with a number of other factors for successful implementation in Canadian schools. These factors include leadership style and qualities (Garrison, 2004), the quality of instruction and its design (Kaufman & Campbell, 2004), appropriately adjusted policies that reflect technology-induced trends in online delivery (Matheos & Curry, 2004) and flexibility in implementations and the definitions of various evaluative models (Owston, 2004). These factors are non-technical but are significant during digital technology implementation in schools.

Considerations for these factors could help in questioning digital technology's utility and appropriateness in any learning environment regardless of whether they are implemented in an urban or rural setting. These considerations are similarly useful for preparing Canadian students to succeed in Canada and in the global economy (Brydon, 2001, 2010, 2011).

Other historic studies conducted by the Centre for Higher Education Research and Development (CHERD) had also shown that the issues Canadian post-secondary institutions grapple with today have not changed much from those of the past. The CHERD papers explored the impact of digital technology in changing institutional policy and practice (Matheos & Curry, 2004). It explored the importance of consortia and partnership for the delivery of online learning (Archer, 2004) and the need to transform faculty culture through an institutional development process (Campbell & Kaufman, 2004). It also examined the need for a mindset that ensured that appropriate instructional design efforts are applied to online learning (Kaufman & Campbell, 2004). These papers seem to draw our attention to a central point, that it is not digital technology in and of itself that contributes to cognition, teaching and learning. Rather, it is that cognition depends on a number of very significant integral factors such as policy and practice, people and partnerships, evaluation strategies, institutional culture, instructional design and even more so, an understanding of the learning needs of the learners. Digital technology's appropriateness in a post-secondary setting should consist of an assemblage of practices, people, devices and culture (Hlynka, 2012).

2.7 Cognitive Impacts in a Technological Ecology

The factors mentioned in the previous section constitute elements of what I may term, technological ecology, a concept that is somewhat similar to Neil Postman's media ecology (see: Hlynka, 2012, p. 32). Media ecology is a group or a constellation of technological elements that brings value to the ecology. People, practices, tools, and their culture are all part of the ecology. The people in the ecology derive value when they utilize the technological tools available to them. As value is derived and as they continue to utilize these tools, their practice and culture is likely to be transformed. This transformation is likely to inform the redesign of old tools to create new

tools or to automatically trigger the development of new tools and technologies. This cycle is likely to continue as the ecology benefits from its inputs and practices. During this redesign and redeployment cycle, it is likely that the individuals might infuse their own biases in the design and subsequently, the application of the digital technology. A piece of technology might likely contain the “essence” of the technology’s creator (Heidegger, 2007).

A constructed piece of digital technology could be described as an expression of the implementer’s essence or beliefs. It could be a tool to convey his or her intents. Intents are not devoid of bias (McLuhan, 1994, p. 11). By extension, technology’s application to any context could be an extension of the designer’s intent and/or bias on users. Sometimes intents may be imposed on the user against his or her wishes.

The use of digital technology may produce outcomes different from one context to another. Two cases in which the same piece of digital technology was used to produce different outcomes in two different contexts were the Arab Spring, which took place from 2010 to 2011, and the Occupy Movements, which took place from November 2011 in the US and in other parts of the Western world. Mobile phones and social media were used as tools for communication and advocacy to unseat several governments in the Arab world (Howard et al., 2011) while they did not have the same effect during the Occupy Movements (DeLuca, Lawson, & Sun, 2012; Gleason, 2013).

Likewise, digital technology may not achieve impacts that are likely to lead to cognition even when the same tools are applied with similar approaches to two different contexts. Contexts are different and so are their technological ecologies. The application of a technology in any ecological context could transform its cultural and social dispositions; it could help to produce cognitive gains. But this outcome may not be guaranteed across different contexts. Many factors

may contribute to why this is so including factors such as the disposition of the people involved or their willingness to allow that piece of digital technology to transform their culture. Their ability and willingness to redesign, develop and redeploy that digital technology to suit their specific needs could also be a factor. Nevertheless, those involved in its implementation may have to strip the tool of its inherent bias for them to be able to adapt it specifically to their context.

The form of examination that questions the impacts of technology in an ecology should be more profound than the outcomes that result from the mere application of technology. Technology does change practice at a superficial level. It has changed free speech and expression in predominantly closed societies of the world (Howard et al., 2011). But the more profound issue that begs consideration concerns digital technology's impact on practice at a deeper level. We should therefore be asking, "What long-term impact does that piece of digital technology have on the culture of the people in the ecology?" If digital technology were applied in an educational context, then most certainly outcomes that resemble learning and outcomes that could lead to long-term cognitive impact would be desired. But certain factors could be present that may prevent the realization of desired long-term cognitive impacts. Factors in an Indigenous context such as existing cultural practices and the present and potential ability of the people in the context to use technology tools could influence the choice of digital technology. These factors could also determine whether the chosen digital technology would be appropriate for producing learning outcomes that result in long-term cognitive impact. Similarly, the uniqueness of an Indigenous context should determine whether a piece of digital technology is appropriate for use within that context or not. Their inherent biases should be understood, accounted for, and mitigated.

As a student of culture my identity has been subjected to cultural influences from the global south where I was born, socialized and schooled. It contains influences from the global

north where I have lived and which has become home. I have observed similarities between my culture and those of Indigenous Canadians who are participants in this study. My identity is replete with prejudices, biases, experiences, knowledge, and preconceptions that had come from various past and current influences and which I had to be conscious of throughout the study.

While this identity significantly defined who I am and may have significantly informed my interest in this study, I was aware that the study participants' interest had to be considered, preserved and included in the study's considerations. In consultation with the participants, I ensured that they defined the long-term cognitive impacts that they would like to see from the study.

Consequently, administrators and educators who define, design and support the application of digital technology in Indigenous educational contexts should be careful to strip themselves of any inherent bias with the use of digital technology, adhere to the needs of the community, involve them in articulating these needs and ensure that solutions not only respond to these needs but that the implementation of that technology is mutual and collaborative. This study was conducted in this manner.

2.8 Chapter Summary

In this chapter I have highlighted the factors that had shaped both the global and the Canadian post-secondary landscape. The focus and perhaps the single most driving force behind the immediate past government's policy on post-secondary education that lasted from 2006 to 2015 was to increase Canada's role and participation in the global economy. The position of the current administration is still evolving although there are indications that it is more inward-focused through increased support for Indigenous learning. Federal and provincial governments' support for post-secondary education remains the same and federal and provincial fiscal

arrangements continue to shape the domestic landscape of Canadian post-secondary education. Government funding determines the extent to which Indigenous learners have access to post-secondary education.

It is clear that there remains a significant “digital divide” in the research location. Many important considerations are required to narrow this divide, which is also present in many other northern Indigenous communities. The appropriate implementation of digital technology in a remote Indigenous post-secondary school is one such consideration. Digital technology’s influences and biases should be addressed when it is considered for implementation. In a globalized society that has its social justice issues, cultural associations and dominant tendencies, any digital technology should be examined to determine if its implementation brings with it global biases that could potentially create issues that further disenfranchises the local educational community.

Educational institutions such as the University College of the North should ensure that it examines whether an implemented digital technology adds benefits to the target community. It should examine the digital technology for inherent bias and ensure that the target community participates in shaping its implementation and in determining how that digital technology could accrue benefit to the community.

An argument advanced in this chapter is that for technology to influence cognition in productive ways for Indigenous learners, consideration for a technological ecology consisting of other elements besides the technology itself must be made. The technology’s application in the Indigenous context should be seen as distinctive to the context in which it is applied. While lessons from other contexts may be useful, the appropriateness of a technology to a given context is unique to that context.

A second argument advanced is that an externalized view of the broad context is necessary to examine and challenge any assumptions inherent in technology's application. Ultimately, it should concern educators and policy makers if the "doing" of a piece of technology results in the "undoing" or "re-doing" of an aspect of society; and whether these resulting actions cost more socially, economically and culturally.

The third argument advanced is that the standard procedure of applying Eurocentric assumptions about technology, because of its inherent bias, and because most modern technology applications are not necessarily local, does not necessarily promote Indigenous betterment. With the use of technology in one culture, comes the likely postulation of the superiority of that culture over another (Carlson, 2007). This method of implementing technology should include consideration for other cultures. Through such considerations we could produce an amazing array of technological responses to practical human problems across multiple cultures rather than a one-size fits-all solution that could emerge from a generalized response to problems from one culture.

Chapter 3 will describe the research context, the research methodology, its participants and the ecosystem in which this research was conducted.

CHAPTER 3: METHODOLOGY

The University College of the North main campuses and remote centers utilize several forms of educational technologies for learning inside and outside the classroom (discussion with staff and university technical personnel, May 2016). Video conferencing links are established between the main campus and the remote locations. Students and instructors in remote locations use various forms of remote access methods to retrieve and upload contents to servers that are situated on the main campuses. At the time of the study, remote connections were tenuous and they prevented students from accessing or uploading content.

Connectivity and other challenges to learning in Bunibonibee Cree Nation are described in this thesis. This chapter describes narrative inquiry as a research method used for gathering research data. The chapter also reflects on narrative research approaches conducted by Indigenous researchers such as Archibald (1997), Atleo (2001) and Wilson (2008). For clarity, the eligibility criteria for participants, study activities and additional research questions are presented in a tabular format. The chapter also describes how the research data was analyzed.

3.1 Narrative Inquiry as a Methodology

Different research approaches, methods and methodologies permeate the academic research landscape. Qualitative research is one of these methods whose place has historically been debated in a domain that was already dominated by quantitative research (Creswell, 2006; Patton, 1999). Two schools of thoughts characterized this debate. Those who tend to think that research could be defined only by the meaning generated from interpreting “numbers”. The other school of thought comprised of those who think that the situational context surrounding the research told more stories about the study than the mere interpretation of numbers. A third school of thought

emerged of those who believed a combination of numbers and context presented a more accurate representation of the cases in the study. None of these schools of thoughts are wrong.

As concepts such as generalizability and validity were debated, the need to “distance” the researcher from the research also surfaced. This process of creating a separation between the researcher and the study became known as objectivity. In qualitative research it was called bracketing (Gearing, 2004).

A researcher is said to be objective or to have bracketed his or herself when he or she declares his or her interest in the study up front. Researchers are required to be objective. However, as qualitative research progressed, the line that separated the researcher from the research participants often became blurred. Qualitative research methodologies such as ethnography for instance often required researchers to live in community with their research participants. Relationships were developed that were often difficult to break (Andersen, 2012; Benzecry, 2015). Strict objectivity became difficult to attain, even more so in qualitative research. Bracketing became an approach that qualitative researchers used to declare objectivity. They used bracketing to describe how they were connected with the study, its participants and study context.

Bracketing also made its way into quantitative research. Tsai (2007) for instance, used it to insert explanatory materials in the middle of a sentence to explain a quantitative research outcome. This rather simplistic use of bracketing in quantitative research might appear not to have negatively infringed on the worldview of quantitative researchers. It rather allowed the quantitative researcher to strengthen his or her arguments about the study.

Bracketing is central to qualitative research and a very essential element of this research paradigm (Cardinal, 2010; Clandinin & Connelly, 2000). Qualitative research methods such as

narrative inquiry allow the researcher and the research participants to weave their narratives into the study.

Clandinin & Connelly (2000) describe narrative inquiry as a rigorous research framework. Creswell (2006) describes it as both a “method and a phenomenon of a study [...] expressed in lived and told stories of individuals” (2006, p. 54) who become actively involved with the researcher in the study (2006, p. 57). Narrative research is rigorous and systematic. It can be conducted from an individual’s perspective or from the collective perspective of a group.

Narrative research has its roots in different fields of study including anthropology, sociology and education. It could be represented in various forms of study such as autobiographies, life or oral histories (Creswell, 2006, p. 55). This study utilized narrative inquiry for gathering data and phenomenology as the overarching research paradigm.

Phenomenology is “best understood as a radical, anti-traditional style of philosophizing, which emphasizes the attempt to get to the truth of matters, to describe phenomena, in the broadest sense as whatever appears in the manner in which it appears, that is as it manifests itself to consciousness, to the experiencer” (Moran, 2000, p. 4). Having its origin in eighteenth century philosophy, philosophers like Lambert, Herder, Kant, Fichte, Hegel and Brentano had used the term to describe various experiences in physics, metaphysics, human consciousness and spirituality. Later Edmund Husserl popularized the term by “extending the application of descriptive psychology” to what he later called phenomenology (Moran, 2000, p. 9). Husserl conceived phenomenology as “a science of the essential structures of pure consciousness with its own distinctive method. ...[It is] an exploration of the conceptual foundations required for any kind of knowing or cognizing. ... [It] is concerned with concrete acts of meaning, meaning-intendings” and going back to fix those meanings so that we can distinguish between the psychological and

the logical (Moran, 2000, pp. 60, 91–92). This approach is consistent with narrative inquiry which allows individuals to use artifacts such as memory boxes to make meaning of their current lived experience (Creswell, 2006; Tsai, 2007; Young et al., 2010).

3.2 Why Narrative Research

Creswell describes five qualitative research approaches (Creswell, 2006). He portrayed phenomenology as a research approach that was about making meaning of a lived experience. From a phenomenon about a lived experience, theories could be postulated leading to what he called grounded theory. Grounded theory is the “discovery of a theory, [or] an abstract analytical schema of a process” (2006, p. 63) based on one or several lived experience of the researcher and those involved in the research. A grounded theory approach was used to produce the Techno-Culture Adaptive framework in this study which is later discussed in chapter 5 (Coyne, 1997; Strauss & Corbin, 1994).

Another research approach is ethnography, which involved the researcher situating him or her self within the research context often for an extended period of time. Creswell also described case study as a research approach that was extrapolated from ethnography. The choice of a research approach is dependent on its contextual suitability and the preference of the researcher. Broadly speaking, narrative research approaches are qualitative research methods that respond to the debate on objectivity raised by quantitative researchers (Clandinin & Rosiek, 2007, p. 36). Narrative research could be written from a single narrator or actor’s perspectives (Bal, 1997, p. 9) and it should be perceived as a method that allows the researcher to shed more light on the study (Morgan-fleming, Riegle, & Fryer, 2007). Narrative research could also involve the analysis of a context from the perspective of a multiple complex of individuals. Atleo (2001, p. 105), in her description of narratives suggested that

Although individuals may embody "narratives", narrative complexes are to be understood as the legacy of a group rather than individuals, hence they require group-based mythic and cultural sensibilities to plumb their depths and develop understanding with which to handle the interpretations of the story.

The amalgamation of these viewpoints provides a complex but more complete reconstruction of a phenomenon, experience, or story.

Narrative analysis helps to determine cross-cutting themes in a series of stories. It involves the restorying of collected events and happenings into a cohesive sequence or form (Creswell, 2006). Both analysis and restorying are what narrative inquiry is. Narrative inquiry is not merely a collection of stories later retold but a systematic analysis of those stories situated within a research context.

Analytical stories in research were used by Atleo (2001, 2009), Archibald (1997, 2008), and Cardinal (2010) who expressed their lived experiences using metaphorical representations of animals such as the coyote, or of inanimate but significant technologies, such as the basket or the knife. These researchers craftily wove tradition and culture in storywork forms into research. Through their narrative lens they provided analysis of their context in relation to their education and experience and in relation to those of their research participants. Some of these correlations and their uses in Canadian post-secondary education are described in the following section. These approaches especially phenomenology and narrative inquiry were used in this study.

3.3 Narrative Approaches in Canadian Post-Secondary Education

When Archibald (1997) described the correlation of storywork to education in her "First Nations stories and their application to education" (1997, p. 3), she centered herself in the *Sto:lo* Nation of the Fraser Valley of British Columbia. She spoke of *Sitel*, or basket, as a metaphor for

elementary social studies curriculum based on Indigenous stories and of coyote as an ageless character that could transform into various figures in order that a story's lesson could be driven home. Through these archetypes, Archibald applied traditional stories to educational issues. Her analysis described tensions between First Nations orality and the contradictions of western education posed by the need to translate from her language to English.

She argued that educational and social values are lost as a result of “weak translations from Aboriginal languages to English” (1997, p. 8), and that a tension emerges between the explicitness of academia and the implicitness and subtlety of Indigenous First Nation's culture, of orality and of literacy. Atleo (2001, p. 103) expressed similar tensions in her dissertation on “learning models in Umeek narratives” in which she argued about the integrity and reciprocity of social contracts established in marriage through orality that was absent in western treaty negotiations.

Atleo, like Archibald, stressed her points by drawing on stories of the *Nuu-chah-nulth* Nation's archetypical *Umeek*, the “community provider” or “go-getter” (Atleo, 2001, p. ii) to elaborate eight learning models. Drawing on the metaphorical basket, she described it as “technology which extends the body” (2001, p. 3) because of its structural synchronicity with the body's physiology in the carrying out of its various functions for transporting and delivering goods – a concept not too distant from McLuhan's (1994) description of technology as an extension of man (or woman) and Carlson's (2007) elaboration of people who through their societies used technology to achieve material abundance, social order and cultural meaning. This study explored this concept of technology as a natural extension of an individual. The study investigated the possibility of digital technology as a cognitive extension of Indigenous students' learning context.

For Atleo, *Ummek narratives* provided a conceptual framework on strategic learning for life career development, learning theory, education, and career counseling without altering traditional epistemologies and ontologies of the *Nuu-chah-nulth* Nation. Albeit, “the problem is that such cultural orientations to means of learning are not systematically acknowledged or considered in the construction of Indigenous education that begins with a Euro-institutional perspective of the world (2001, p. 6).

There are lessons to be learned from cultural orientations that could facilitate teaching and learning in both Indigenous and non-Indigenous communities. Atleo expanded on Archibald’s “conceptual framework for understanding storywork as ‘cultural work’” into what she termed the *Four R’s* for “Respect, Responsibility, Reverence and Relations” and the *Four D’s* or system dynamics that represented “reciprocity, wholism, inter-relatedness and synergy”. These principles are sometimes perceived as ephemeral and non-empirical in academic settings. However, they “provide clues about social protocols in which the ‘figure of the story’ leaps out of the background of the cultural context so that it [c]an be examined for learning strategies” (Atleo, 2001, pp. 13-14).

Atleo’s attempt to make these connections between cultural contexts and academic learning was further elaborated in her description of the “culturally modified hands” (Atleo, 2015) in which she paralleled the metaphor of the *chitulth* or knife as an ergonomically shaped cultural tool that extended the natural flow of her hand for cutting fish, with the concepts of sustainability, consumer science, food production and home economic education.

For Atleo, and most certainly Archibald, storywork and its principles, especially stories told from cultural perspectives were used to convey life lessons that shaped the identity and culture of a people and that sensitized them to the “demands of pragmatic shifts of epistemic

transformation [that are] inherent in western developmental logic” (Atleo, 2001, p. 25). For them, storywork was another way of countering the narratives of western ideologies while instituting faith and belief in Indigenous epistemologies; allowing the recognition of Indigenous epistemology as a central moral and spiritual activity in education.

As education is a moral enterprise that is cross-cultural, it should not be surprising then that in a description of traditional African modes of education, Omolewa (2007) would depict African education as forms of epistemologies stored in various modes such as language, music, dance, proverbs, myths, and stories that focus on the inclusion of all and the pursuit of excellence. Omeluwa’s description of learning is consistent with Canadian Indigenous methods. These methods are community initiated and generated to include practical common sense that is based on holistic teachings and experiences that are integral to the people and their ways of life. Life’s lessons are taught from the cradle to the grave with the intention of producing well-rounded individuals that are cultured, respectful, sensitive and responsive lifelong learners. These methods underpin the concept of Indigenous-based reasoning defined in chapter 1 and discussed in chapter 4.

Omelewa (2007) described proverbs, myths and stories as African modes of conveying community collected testimonies and inexhaustible wisdoms of the past that were inherited for many generations and transmitted in oral forms. Proverbs were sources of wisdom and philosophy that highlighted respect, dignity, empathy and kindness. They governed religious and social behaviour (2007, p. 599). Stories were used to correct attitudes and provide lessons in honesty, integrity and accountability, and to induct youths into moral, philosophical and cultural values of the community. African knowledge systems held value; they still do, and could still contribute to the present modern forms of learning, even though some of these modes have suffered from the

Eurocentric disruptions of colonial times. Stories have the potential for influencing education and learning.

Stories that are embodied by learners (Atleo, 2001) can be developed, recognized and integrated into school learning experiences. There may be a need to adjust learning curricula to recognize traditional knowledge and a willingness to adapt it for the learning context.

The struggle for recognition and acknowledgement of narrative epistemologies, practices, and ontologies in Canadian post-secondary settings continues to the present time. Storywork, storytelling, narrative inquiry and narrative analysis could contribute to learning. There are lessons to be learned from the histories of Indigenous peoples.

3.4 Historical Development and Philosophical Underpinnings of Narrative Analysis

Narrative inquiry, storywork, and narrative analysis have their roots right from the birth of a child to adulthood (Baddeley & Singer, 2007, p. 198)

At the start of our lives, we inherit a story given to us by our culture through our parents. Our life is in some sense an effort to forge our unique version of this inherited story. We fill it in and embellish it with our lived experiences, as we understand them. Because we and our stories are embedded in a social matrix, we are motivated to develop our stories in coherent forms that are understandable to ourselves and can be understood by others in our culture ...By the time we are ready to leave this world, we have returned our story, now made in our own image and filled with unique variations, back to the culture from which it began. We return it not only to our children but also to a larger community through our relations to institutions, such as churches, mosques, or synagogues and organizations, both social and political. We began life with a story that was not our own and slowly crafted it

to be our unique possession, but in the end, we return it to the vast library of shared stories that constitute our culture.

Our lives are stories that span pre-birth to death. Through “triple bookkeeping”, our storied lives are analyzed from the biological, psychological and social dimensions to achieve an understanding of a person’s identity in relation to their context (Baddeley & Singer, 2007, p. 177). Baddeley & Singer (2007) trace life’s narratives through different stages of birth, childhood, adolescence, young adulthood, middle adulthood, and older adulthood. Stories are not new but narrative methodologies in the field of social science research may seem so (Clandinin & Rosiek, 2007, p. 35). Narrative methodologies may appear personal but they are not only about the individual alone, as an isolated entity. They are about his or her relationship to a context that is inhabited by individuals and groups. In this regard, storywork takes on a collective approach that could be similar to the socio-environmental approach originating in Deweyan theory.

Clandinin and Rosiek (2007) trace narrative inquiry to Deweyan 20th century endeavors suggesting that “experience is the fundamental ontological category from which all inquiry – narrative or otherwise – proceeds” (Clandinin & Rosiek, 2007, p. 38). They suggested that narrative inquiry is about a relationship between the human and the environment, an ontology that underscores the temporality of knowledge generation and one that emphasizes continuity. Every representation of knowledge is a careful selection of aspects of our lived experiences as we undergo them through periods of time. Whole *knowledges* are created from experiences that are concatenated, continuous and connected to social aspects of our lives.

One experience leads to another and then to others, in a continuum. In other words, “what we see (and hear, feel, think, love, taste, despise, fear, etc.) is what you get. That is all we ultimately have in which to ground our understanding. And that is all we need” (Clandinin &

Rosiek, 2007, p. 41). These experiences take shape and are influenced by the environments and the social aspects of our context so that inquiry into them produces ways of enriching and transforming the lives of the participants. The experiences generate new relations that transform into components of future experiences. This notion that experiences enrich our lives is consistent with McLuhan's suggestion that "one has only to find the center and everything is revealed at a glance. In England the paths run crisscross, and it is only by travelling down each one of them that one can build up a picture of the whole" (McLuhan, 1994, p. 14). It is about seeking knowledge of the narrow pieces of our own experiences that the whole takes shape and makes sense to us. Narrative inquirers therefore study "an individual's experience in the world. Through the study they seek ways of enriching and transforming that experience for themselves and others" (Clandinin & Rosiek, 2007, p. 42).

These concepts may be consistent with learning in Indigenous post-secondary settings. Individual experiences bring agency to learners who achieve their personal agenda and assert their own values through interactions with other peoples (Busher, James, Piela, & Palmer, 2014). Collectively, learners negotiate the various social and institutional structures that have hitherto impeded their individual agency and consequently their educational inclusion. Our collective experiences could produce lessons that could inform how Indigenous communities learn to orient and adapt to learning between multiple contexts and how educational technologies could help to produce documentation for orientation and adaptation.

In this study, participants used digital technologies such as their mobile devices and computers to produce documentation for their learning adaptation and orientation between Indigenous and Eurocentric worldviews. Using these devices they created *digital artifacts* such as images, videos, texts, and voice files (Downey, 2015; Erstad, 2002; Morgan-fleming et al., 2007;

Taylor, 1999; Viegas, Boyd, Nguyen, Potter, & Donath, 2004). Digital artifacts have been used extensively for narrating phenomena and for pedagogical, social, affective and cultural learning. Viegas, Boyd, Nguyen, Potter, & Donath (2004) utilize email as a digital artifact and a visualization tool for self-reflection and to elicit the retelling of stories from their study participant's pasts.

Jung, Stolterman, Ryan, Thompson, & Siegel (2008) used a group of interrelated digital artifacts, or what was described as an "ecology of artifacts", to explore the implicit and explicit relationships among interactive digital artifacts and a person's personal life. Their findings indicated that digital artifacts exert an emotional, experiential and social influence on users' daily behaviour and perception. Gulotta, Odom, Forlizzi, & Faste (2013) explored the value and legacy of digital artifacts; from their study they described the inherent intergenerational value of digital artifacts to maintain legacy and to connect with the past and future generations. Erstad (2002) utilized digital artifacts among three groups of students' case studies to arrive at their utility to influence the future design of new learning environments and to stimulate knowledge construction among students.

Participants in this study created narratives of their learning experiences from the digital artifacts that they produced. These narratives were analyzed to describe how they were able to adapt and orient between Indigenous and Eurocentric learning. The following section describes the research objectives, participants, questions and the instruments used in the study.

3.5 Research Objectives

The objective of the study was to identify the determinants that assist a sample of post-secondary Indigenous learners in a remote isolated community in Manitoba to adapt and orient

between Indigenous and Eurocentric ways of learning. The study used digital technology to create documentation from digital artifacts about learners' adaptation and orientation.

3.6 Research Participants

The study participants were identified using purposeful sampling method (Coyne, 1997; Suri, 2011). Purposeful sampling enabled the sampling and selection of “*information-rich* purposeful cases for study in depth” (Patton, 1990). These information-rich participants were central to the research because they provided cases, “from which one can learn a great deal about issues of central importance to the purpose of the inquiry” (Patton, 1990, p. 169). Studying information-rich cases yield insights and in-depth understanding rather than empirical generalizations.

A total of 14 participants were recruited into two groups: eight (8) primary research participants were directly involved in the study activities and six (6) secondary participants were interviewed only to provide additional context to the study. Primary participants were information-rich because they resided in the research location at the time of the study and were involved as learners in the University College of the North center. They also granted consent to participate in the study.

Secondary participants were information-rich because they had provided either administrative, technological, infrastructural or utility services to the community where primary participants resided. Participants were recruited using a consent form that provided them with options to opt out of the research and to adjust their research data if necessary. Ethics approvals to conduct the study were granted by the University of Manitoba Education/Nursing Research Ethics Board (ENREB) and the University College of the North's Research Ethics Board (UCN REB). Eligibility criteria and expected participant type and numbers are listed in Table 3.

Table 3: Eligibility Criteria

Eligibility Criteria for Primary Research Participants (n=8)	Eligibility for Secondary Research Participants (n=6)
Met ALL criteria below: <ul style="list-style-type: none"> • Resided in Bunibonibee Cree Nation • Self-identified as Indigenous • Enrolled at a program offered by University College of the North throughout the research period • Over the age of 18 • Had successfully completed high school/GED program • Fluent in English • Had indicated willingness to actively participate in the study activities and to be interviewed. 	<ul style="list-style-type: none"> • Had intimate knowledge of Bunibonibee Cree Nation • Was willing to participate in an interview • Fluent in English Must meet ONE item below: <ul style="list-style-type: none"> • Identified by Bunibonibee Cree Nation as an elder or community leader (n=2) • University College of the North staff involved in designing and/or implementing technology to support remote students in Bunibonibee Cree Nation (n=0) • Employed in an administrative capacity at University College of the North and makes technology/telecommunication infrastructure decisions that affect Bunibonibee Cree Nation (n=1) • University College of the North educator who delivers content or implement technology in Bunibonibee Cree Nation (n=1) • Employed by an institution involved with internet/ telecommunication infrastructure provisioning in Bunibonibee Cree Nation (e.g. MTS) (n=2)

3.7 Research Questions

The overarching research question was “*what are the determinants of technological adaptive orienteering among adult learners in First Nations communities in northern Manitoba?*”

Additional research sub-questions and tasks were tailored specifically to the different participant groups in the study. These sub-questions and tasks are presented in Table 4.

Table 4: Sample of Participants' Interview Questions, Schedule and Activity

Research Participants	Research Activity Title	Duration	Sub-questions (Interview Questions) and Tasks	Remarks - Notes
Primary Participants	Interviews	1 session of 60 minutes each	<p>What individual stories emerged from your use of technology that you think contributed to or impeded your learning?</p> <p>What factors motivated your use of educational technology?</p> <p>How could educational technology use improve engagement within your community?</p> <p>How valuable would educational technology, especially mobile devices be in contributing to your academic success, and to the value of your learning?</p>	Notes were taken during interview. Recording device was used where necessary, and not used if participants declined.
	Participatory Video	3 x 3-hour sessions of class/instruction and hands-on activities on creating and editing videos.	<p>What was your family lineage? How did your family live?</p> <p>What historical injustices did your grand parents experience and what sacrifices did they make?</p> <p>How was knowledge and information about your land passed down?</p> <p>What cultural technology existed in your grand parents' times? (e.g. knives, tools, etc.).</p> <p>How do they use digital technology such as mobile phones today?</p> <p>How long ago did they start using digital technology?</p> <p>How did digital technology positively or negatively influence their community?</p>	Participants used their mobile devices i.e. voice and video recordings and cameras to explore the histories of their community in connection with the land. They interviewed family and community members.
	Picture/Photo Voice	8 x 15 minutes each = 2 hours total of instructions and hands on of taking images using a mobile device.	Take pictures of significance of the land, community, and any images of family.	Participants created narratives of family history based on the pictures they took. They retold their own stories from the narratives they created.
	Personal	1 x 5 reflection	What part of your lesson this	Reflections were

	Reflections	captured in a 1-minute video or voice recording of their learning. Or 250 word reflection captured on their blog.	week resonated most with you? What resonated with you most in your projects: a) participatory video, b) picture/photo voice, c) personal connection project, d) influencing the internet, e) visual narrative, f) discussion, and j) interviews.	created after participants analyzed the digital artifacts they produced. Their reflections were captured as voice or video recordings or as blog posts
	Personal Connection Project	1 x 60 minutes to create a personal connection project.	Using information gathered from family interviews, create a paper-based family tree.	Research participants reflected on their family connections and then created a digital artifact that captured their family genealogy.
	Influencing the internet	1 x 60 minutes for participants to create 250 word article or recorded speech (transcribed) to update the Bunibonibee Cree Nation Wikipedia Page.	What important fact or perception about your Bunibonibee Cree Nation would you most like to tell?	Participants created community-based articles generated from their own research, transcribed them, and then updated a Wikipedia article with their findings. Participants were required to create a Wikipedia account or use a pseudo account in case of concerns about privacy.
	Discussions	N/A Project is discussion based and will run according to scheduled session. Five sessions of 12 hours each were scheduled.	N/A	N/A
Secondary Participants: Elders at Bunibonibee Cree Nation	Interview	1x 30 minutes each	What motivated you to use your mobile device or any communicative piece of technology? What previous implementations of technology such as mobile networks, community internet, or telecommunication have you seen implemented in the last decade through a government or industry initiative? How would you rate the service the community	Interviews were recorded and transcribed.

		received?	
		What factors impeded technology use among community members?	
		How best did you think some digital technology was used to benefit the community especially among elders?	
Secondary Participants: Faculty member at Bunibonibee Cree Nation, Technical Personnel	1 x 60 minutes	What approaches were adopted to accelerate technology use among teachers, students and community members?	Notes were taken, recorded and transcribed.
Researcher's personal reflections and notes from observations made during interviews, community engagement sessions, focus group activities and classroom sessions.	Several reflections	What approaches were used with your students? 1. McLuhan's framework: a) What does digital technology that is applied in a First Nations community enhance or intensify? b) What would the digital technology render obsolete or displace? c) What does that technology retrieve that was previously obsolescence? d) What would it produce or become when it is pushed to an extreme? 2. What outcome of the activities conducted with the research participants informed the creation of a conceptual framework through grounded theory approach?	Reflection notes were compiled and included in the data set.

3.8 Research Method

Primary and secondary participants who signed consent forms and agreed to be a part of the study participated in the research activities listed in Table 5. These activities were conducted over a three-month period.

Table 5: List of research activities

Proposed Research Activity/Instrument	Description	Research Activity Detail
Participatory Video	Videos recorded on mobile devices of interviews of parents, family members, community members, and elders.	Participants used videos to research family heritage, ancestry, and to tell stories of their family lineage.
Picture/Photo Voice	Still pictures of land, people, community, farms/gardens and occupations such as trapping, hunting and gathering.	Participants used pictures to create stories about their communities, family history and heritage.
Personal Reflections	A critical reflection of their learning practices and journey through self-questioning and assessment.	Participants reflected on their learning using active voice recordings, videos, pictures captured during community research. Participants documented their reflection as blogs or videos recorded and posted in their online community space.
Personal Connection Project	A personally relevant activity that generates critical thought and documents personal history	Participants created a paper map of their family tree, which they converted to digital form and uploaded to their blogs and wiki spaces. They also embedded pictures, voice and recordings videos to their digital family tree.
Influencing the internet	Proactively acquiring online “assets” by telling personal and community owned stories.	Participants updated and took ownership of the Bunibonibee Cree Nation Wikipedia page by creating and updating the site with community-generated, fact-based information.
Discussions	Discussions sessions.	Participants held several discussions on the influence of digital technology on their learning, education and culture.
Interviews	Question and answer sessions conducted in the language of the community, Cree or in English where necessary. Primary research participants were interviewed before and after participating in research activities.	Both Primary and Secondary participants responded to research questions. Responses were recorded, transcribed and translated.

Participants utilized their personal mobile devices such as smart phones and tablets. They created digital artifacts of images, videos and voice recordings from interviewing family members, community members and themselves. Recordings were about their traditions, the locations where some traditions were undertaken and the characteristics of these traditions. Interview questions listed in Table 6 were sample questions used to conduct interviews of community and family members. Participants were able to adapt these questions to the specific context of their interviewee in English or in Cree, and the tradition, location and characteristics that they discussed.

Table 6: Participants' Community-Centric Interview Questions

Traditions:	Location:	Characteristics:
<ul style="list-style-type: none"> • What type of stories do you know? And who told you these stories? 	<ul style="list-style-type: none"> • Fish camps: What did you do at the fish camps? Why is the fish camp important to you? • Trap lines: What transportation did you use to get there? Did you use the same trail that other trappers used? Do all trappers go together or do they split? Where did you split? • Rivers – Do you remember Joseph Muskego killing a moose on the river? What Cree names do the rivers have? How many rivers are there? • Bunibonibee Cree Nation – How did it get its name? Which is the first building built in the community? How did Oxford House come about? 	<ul style="list-style-type: none"> • Clothes: What was your clothing made from? Who made them? When did your clothing change from what it was to what it is now? • Birthplace: Which area in Bunibonibee Cree Nation were you born? Were there midwives that helped deliver babies? Who was the first midwife? From where did they move and from where did their grand parents move? • Housing: What kind of houses did you live in? You use to live in tipis, when did you first build your log house? When were log houses first built? • Education: What survival techniques were you taught? • Transportation: How did people move around? Who made the canoes? (Snow shoes, bobsleds) • Parenting: How did parents educate their children? • Food: What type of food did you eat? How much meat did you need? How much food did you have to gather for the winter? • Traditional Medicine – Where did they come from? What types of plants were used for medicine? • Ceremonies – What ceremonies did you have? Were there powwows? What sorts of feast were they?

Digital artifacts captured during the interview were unavailable to the researcher, in response to the principles of ownership, control, access and possession mentioned in chapter 1 (OCAP/FNIGC, 2013). Participants stored their data in personal memory drives and on cloud drives.

After generating their data, participants were interviewed for 60-minutes each using the questions mentioned in Table 4. Secondary participants were also interviewed. All interviews were recorded. These interview data were the only data used in this study. Some participants utilized stories (narrative inquiry) to present their data to the researcher.

3.9 Data Validation and Integrity Check

All research participants signed a consent letter that included an opt-out clause should they wish to be excluded from the study. Presentation of findings complied with existing access policies and protocols that made up the “safe frame” described in Chapter 1. All data, whether sensitive or non-sensitive, confidential or identifying in nature, were collected and were securely stored on appropriate online servers using secure passwords that were known only to the researcher. On completion of the research, all data were downloaded to secure storage devices at the University of Manitoba and then deleted from their online locations.

Data in other forms, written or drawn, and other paper-based information with or without potential identifiers were securely stored at a secure location at the Faculty of Education, 71 Curry Place, Education Building, University of Manitoba, Winnipeg, MB, R3T 2N2. They will be retained for 10 years and then professionally shredded.

To ensure confidentiality specific identifiers were removed from the data and pseudonyms were used. During the study, participants were reminded that they were participating in a group project and were asked to remember confidentiality during and after all research activities.

Participants were advised that they could choose to remove all or part of their discussion at any point during the study. This information would then be deleted from any project notes, recordings and/or transcripts. No participant withdrew from the study, they did not get credit for their participation, and no honorarium was paid.

The research activities were low-risk and they posed no more than the usual physical, psychological or emotional risk to the research participants.

3.10 Data Analysis

Data was analyzed in three passes (see Table 7) using the *Mobile Technology Mediated Adaptive Orienteering Framework* presented in Chapter 1 as a data-gathering framework.

Table 7: Data Analysis Categorization

	First Pass	Second Pass	Third Pass
First Level (Making sense of the data)	A. Broad Categorization -> Technology -> Culture Adapted from Atleo's field of metaphorical mapping Atleo (2001)	A. Broad Sub-themes -> Motivational impacts -> Perceived Value Adapted from Bertram et al. (2015)	A. Categorization -> Sociocultural challenges -> Factors influencing technology/culture -> Emergent Cognitive Shifts -> Consequences, intended or unintended -> Affordances and potential impacts
Second Level (Presenting the data)	B. Colour Coding		B. Data Presentation

The process of analyzing the data entailed two levels of activities. The first level of activity was meant to make sense of the data and the second level was intended to categorize the data into meaningful themes.

There were three passes in each of these levels. At the first pass in the first level, the data was separated into two broad categories, technology and culture. Data that fell into the technology category related to educational technology needs such as the use of mobile phones, internet and computers. Data that fell in the culture category related to any cultural activities that participants deemed were important to their learning. From these two broad categories, technology and culture, the data was further analyzed in the second pass for broad themes.

At the second pass, cognitive shifts had resulted from the activities both in the use of technology and in the adoption of a culture-centric approach to pedagogy. Also, data that made

references to traditional practices such as dances, storytelling, community based occupations, i.e. fishing, trapping, ceremonies, family gatherings, and heritages were categorized under culture.

During the first pass, statements were colour-coded, annotated, and re-categorized, where necessary.

At the second pass, both the technology and culture categories were analyzed for statements to identify sub-themes that appeared to produce motivational outcomes or perceived value to the learner. Outcomes such as the ability of digital technology to enhance existing local cultural practice, its ability to make it obsolete, recreate or replace it were further categorized under subthemes. Outcomes such as the positive or negative impacts of technology on culture were also categorized into subthemes.

The final pass of the first level entailed conducting an analysis of the subcategories created in the second pass to identify the stories the data “told”. This analysis was guided by the following questions such as:

1. Which of these sub-themes (effects) resulted from similar impulses (causes)?
2. How could the data be best presented to the reader of this study?
3. What clear statements best represented these sub-thematic categorizations of data?

The second level of activity were undertaken to identify the best representation of the data to the reader. During the first pass, broad categorizations were colour-coded to make it easier to see the categories at a glance. After the analysis from the third pass, the “stories” that emerged from the sub-themes were re-storied and re-written in narratives form using narrative analysis techniques (Creswell, 2006).

3.11 Chapter Summary

In this chapter, the research methodology was presented as a phenomenological study that used narrative inquiry as a method for analyzing the research data. Phenomenology allowed the study to focus on the phenomenon of Indigenous learning in which learners adapted and oriented between Indigenous and Eurocentric methods. Using purposeful sampling technique, participants that could provide information-rich cases were selected to conduct research activities and to provide data that shed more light on the phenomenon under study. Participants used digital technology to produce digital artifacts that were in fact, documentation for their adaptation and orientation.

Narrative analysis allowed an opportunity for analyzing participants' narratives and to weave them into themes that told stories of their learning, and that perhaps, provided findings that may help in making decisions about learning in similar contexts. These findings are presented in chapter 4.

CHAPTER 4: DATA PRESENTATION, ANALYSIS AND DISCUSSION

The study was undertaken in Bunibonibee Cree Nation. Research activities were conducted and data was collected during the months of February to May 2016. Prior to conducting the study and data collection, I had visited several northern communities including the University College of the North center at Misipawistik Cree Nation (Grand Rapids), and the main campuses of the University located at The Pas and Thompson. The purpose of these visits was to establish and develop relationships with community members and the administration and staff of the university, and to acquire the support and blessing of the university's Council of Elders. These visits contributed in developing the safe frame described in chapter one.

During this period, specifically in April 2016, the Manitoba Telecommunication Service upgraded the telecommunication infrastructure in Bunibonibee Cree Nation. This upgrade allowed community members including the research participants to use additional functionality on their smart mobile devices. For the first time community members were able to use social media features, share digital artifacts using a cell network and interact without requiring the use of a fixed-location Wi-Fi network.

There had also been several deaths of community members and a community fire that had completely destroyed a property during this period. These incidences had some considerable impacts on the outcome of the study.

In this chapter, I present the research findings. As an ethnographic exercise, my reflections during the study are also presented and captured in *italics*. Where participants have been quoted directly, exact quotes, including pauses, grammar and language have been maintained to capture originality and context. Where necessary, they have been annotated to provide clarity. What may

be considered as observations are presented as statements in *bold and italicized* letters, which are further elaborated in the paragraphs in which they appear.

This chapter describes the research context. It explores the role of digital technology in the safe frame and presents the themes that emerged as an initial attempt at eliciting the determinants that assist learners in the study community to adapt and orient between the multiple ways of learning present in their community.

4.1 The Research Context

In Chapter 1 the process of gaining entry into the research context was described. A “safe frame” was described as an essential determinant for gaining and maintaining access to the study community (Miller, 2001). In the past, protocols such as the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans and the Integrated Knowledge Translation frame were created to ensure that researchers conducted their research in an ethical manner and that they left research knowledge behind, in the community, to their benefit (CIHR, 2011; GC, 2014). While these protocols were sufficient to ensure respect of Indigenous peoples during research, other policies were also required to address, for instance, ownership of research data, its control, access and possession. The principles of what became known as *OACAP (Ownership, Control, Access and Possession)* (OACAP/FNIGC, 2013), were created to ensure that the community in which the research took place benefited from the research and that they had rights to the research data and its outcome.

In addition to compliance to these policies, the University of Manitoba Education and Nursing Ethics Research Board and the University College of the North Research Ethics Board had granted permission for conducting research in the study community. These formal structures

were necessary because they provided the ethical core necessary for conducting research that involved Indigenous participants.

But access alone is insufficient for successful research. Other components comprised the safe frame for this study to take place. Some components that were not part of the formal ethical structures and protocols were also required. For instance, developing sufficient levels of confidence in the community members prior to, during and after conducting the study was equally an important part of the safe frame. An insider researcher might have direct access to his or her community and may enjoy the privileges of easier access to research data and participants. This may however not be as easy for an outsider researcher. Outsider researchers, like me, had to develop relationships that built confidence in the research participants and which necessitated my invitation and acceptance to their community.

To develop the necessary levels of confidence, interaction with the study community commenced at least two years prior to the study. Regular travels by road to Misipawistik (Grand Rapids) Center of the University College of the North and to the main campuses of the university in The Pas and Thompson were conducted. I participated at conferences in these locations where I presented preliminary research ideas and sought inputs to determine the university's research priorities and how these priorities aligned with my research interest. Upon securing ethics approval for the study from both ethics boards of the University of Manitoba and the University College of the North, I sought the "blessing" of the Council of Elders. I presented the research ideas to them after which they provided some additional feedback that helped to shape the study.

All of these activities were necessary for constructing the safe frame. While these protocols, policies and blessings were necessary for the study, they did not guarantee that participants would be involved in the research activities; neither did they guarantee that

participants would willingly provide useful data during the study. The participants themselves also had to grant their own permissions.

Participants wanted assurances of safety during and throughout the study. They constructed the requirements with which they would take me into their confidence and they ensured that I complied with these requirements. The requirements were established when the local Chief and Council granted permission to conduct the research. Until the chiefs granted permission, participants were unwilling to interact with me and to engage in the study and its activities.

One requirement for confidence related to my emotional and physical response during a traumatic incident in the community and their perception of this response. I felt that I could not engender confidence in the study participants if my emotional and physical response was not in alignment with theirs. In addition, to the complexities that arose from trauma in the community, issues such as fatigue resulting from several years of study and familial commitments were also observed as elements that posed challenges to participants in the study. Some of these complexities prevented some participants from participating in the activities. Some participants were unavailable to undertake the research activities when community members passed away (i.e. death in the family). Participants were consequently willing to return and continue with research activities because of the level of confidence I had built in them. This confidence level was determined by my understanding of their emotional and cognitive state at these difficult moments. Their confidence in me further increased because they were able to engage with the study activities at their convenient time. This type of understanding of emotional and cognitive state of the learner is an important part of the safe frame.

The complexity of this safe frame made it rather fragile. It appeared to be a frame that could disintegrate at anytime and at the slight impulse of any undesirable external influence. I had to be self-conscious of the fragility of this frame and to ensure that its structure was maintained throughout the study. I recall being told several times what to say and what not to say because it could fracture the safe frame. Ultimately, this safe frame became a personal code of ethics, as I had to cognitively assume the worldview of the research participants and to remember to shift from this view into that of an academic, and back and forth, many times throughout the research duration. This dilemma was captured during a reflection following my discussion with a participant:

A personal sense of ethics in this case derives from the feeling resulting from either going through a previous traumatic experience or from placing myself in the shoes of the other. I may not be empathetic towards the other if I am not in the “position” of the other or if I do not view things from their perspective. I recall that we talked about patience and time as important aspects of being empathetic. This is also directly related to the question of ethics. Because I have a personal sense of ethics towards the other, I will not impose my ways and times of doing things on them. Rather, I will concede that they have their challenges and from this, I can find ways of adapting to their learning while being patient with them and while considering their availability. I cannot impose my time on them (personal reflection).

This self-consciousness, to be cognizant of this safe frame and its constitutive parts, were necessary for maintaining its existence. To be consistently self-conscious of the fragility of this safe frame and to refrain from taking actions that could jeopardize its integrity was a difficult process. For instance, remembering to carefully shift from the academic to Indigenous worldview,

and back and forth, was always a cognitively engaged process. I became constantly aware not to incite behaviour that could fracture boundaries of the safe frame but to constantly act in a manner that reinforced its walls. It was like walking on eggshells. Insider researchers may not have to tread such paths but this is probably a road often traveled by the outsider researcher.

The existence of a safe frame in an Indigenous learning environment is an important observation and a significant socio-cultural determinant for learning to occur in the study community. This and other findings are presented in this chapter.

4.2 Digital Technology Use in a Safe Frame

It is not a new finding that there exists a significant digital divide between communities in the north of Manitoba and those in the south. Communities in the north have been known to suffer from a lack of infrastructure in comparison to those in the south. For instance, even though a working telecommunication infrastructure was available in Bunibonibee Cree Nation, it was not until April 2016 that the network was upgraded to allow users to have access to broadband internet using their mobile devices that are connected directly to a cell network. This upgrade permitted users to use functionalities on their mobile device to transmit data. The older network was suitable only for making calls. It provided limited coverage that only allowed participants to have voice communications and to keep communication within the study community. It did not permit data transfer and connections to communities outside Bunibonibee Cree Nation was tenuous. The network did not provide the functionality that allowed users from Bunibonibee Cree Nation to connect to the local network in Winnipeg when they visited. Neither did it allow users from Winnipeg to connect to the network in Bunibonibee Cree Nation when they visited.

To use the data functionality on their devices such as the social media including Facebook and Twitter, community members had to connect to a Wi-Fi network that was only available at the

center and in their homes, if they could afford it. While the older network did not permit this type of data functionality, the recently installed network was too fragile and unsuitable for bandwidth intensive applications such as downloading multimedia content, accessing learning management systems or engaging in any real-time video-to-video conversations.

With the recent upgrade, community members began to interact on social media, often creating and sending inciting messages. Cases of cyberbullying became rampant as some community members made social media posts that hurt other community members and that were insensitive to the feelings and emotions of their target recipients. These posts catalyzed dangerous responses that resulted in repeated transmission of potentially hurtful messages between community members, especially the youths. The growing transmission of these kinds of messages resulted in a significant unintended consequence in the community, some of which had traumatic impacts on some community members. This consequence is discussed later in this chapter.

This act of sending potentially hurtful message seemed to suggest that community members did not need a safe frame when they interacted with themselves, but require it when an outsider researcher is in the community. In fact, social media messages were bold and somewhat different from what community members would have said in public. It was unclear whether community members were unafraid of the consequences of such bold declarations when they talk with themselves or whether they felt uncomfortable when they talked with an outsider researcher. Either way, the protocols within this safe frame that allowed for communal sharing of information and that permitted some guarantees of confidence appeared to dissolve when toxic messages are transmitted. It would appear that participants did not care much about protecting the integrity of the frame, as messages that would otherwise have remained in the frame made their way outside

it. All it took was for one participant within the boundaries of the frame to share that post with someone outside the frame.

For an outsider researcher, there is the challenge of first gaining acceptance by the community members and the challenge of being invited into the community's safe frame. Also, there is the challenge of being allowed to interact with community members through digital technology such as the use of social media. Friends and families are responsible for creating the boundaries of their safe frames and for establishing the protocols for communication and interaction within it. They decided what social media to use, the ethics for communication and who to invite. They determined whether an external community member could be permitted to enter into the frame. Primary participants seemed to be unwilling to allow external persons into the safe frame they had created, especially when social media was used for interaction. For instance, when activities were created that required signup to social media accounts, participants were immediately concerned about creating such accounts with their real identity. They wanted to know if they could do so with pseudonyms instead of their real names and identity. Participants cited examples from past experiences and used these examples to justify their unwillingness to sign up to these accounts. It would appear as though suspicions of illegal intentions by previous educators, either to access their privacy or to forcefully enter into the safe frame without meeting the requirements for entry fueled these suspicions.

Clearly, under such circumstances the protocols, policies and blessings of the elders were insufficient to guarantee access. As a result, access to unbiased and useful research data were unguaranteed despite assured access into the study community. Nonetheless, participants engaged in the research after they had allowed the researcher access into the community. They produced data, which were subsequently analyzed to produce some important themes. These themes

emerged from categories that were created after analyzing participants' responses to the interview questions. Themes produced evidence of:

- a) "Connects and disconnects" that affected community culturally and which influenced classroom pedagogy.
- b) Socio-cultural and economic concerns that challenged learning.
- c) Unintended consequences emerging from the use of digital technology.
- d) Affordances of digital technology that could respond to some socio-cultural and economic challenges.

4.3 Theme 1: Disconnects: Technological, Community, Cultural and Pedagogical

Technology, as a double-edged sword, creates both "disconnects" and "connects". "Disconnects" were observed when the application of digital technology created or facilitated the creation of gaps between the research participants, their culture and the community. "Connects" were observed when the application of digital technology produced outcomes that seemed to connect people with their culture and community or that strengthened their Indigenous identity. The emergent themes indicated that connects and disconnects occurred at the technological, community, cultural and pedagogical levels. In this section, the first two themes describe the "disconnects" that occurred in the community while the last two describe the "connects". Determinants that emerge with the description of each theme are indicated with a prefix of "**determinant:**" in bold text.

a) Technological disconnect: There is a significant digital divide in the community.

Working and affordable telecommunications infrastructure is always required to provide value added services such as telemedicine to very remote communities (Downey, 2015).

Telecommunications services like those provided by the Manitoba Telecommunications Services

could be used to provide value added services. However, implementation of telecommunications services in remote communities require more specially targeted approaches:

“Rural/remote areas are characteristically influenced by factors such as scattered user base, resistance to adopt new technology and affordability. These factors result in limited or nonexistent last-mile connectivity infrastructure. They also create a digital divide between urban and rural/remote locations, which results in lack of access to computing infrastructure and leads to economic and social disparities across regions. Revolutionary technologies and appropriate implementation plans need to be explored for rural telecommunication networks, which should be robust, flexible, scalable, affordable, and easy to use (Nandi et al., 2016, p. 102).

The absence of a robust internet infrastructure that could support value added services in Bunibonibee Cree Nation such as tele-health or learning with technology is a significant disconnect in the community. Where suitable telecommunication infrastructure does not exist, consumers tend to purchase connectivity from third party operators, which they can utilize to provide value added services to their clients. Consumers in Bunibonibee Cree Nation such as the elementary and high schools, the medevac center, the airport, and the University College of the North center had to purchase additional telecommunications infrastructure so that they could provide internet and other value added services to their clients. These third party services are expensive to set up and operate. Most telecommunication clients would prefer to utilize infrastructure provided by their incumbent operator rather than those provided by third party operators.

Manitoba Telecommunications Services had provided telecommunications infrastructure to Bunibonibee Cree Nation but its capacity was not sufficient to provide the kinds of value added

services that the medevac unit, the schools, the nursing station and others would have liked to provide. That infrastructure was unable to provide bandwidth sufficient for services such as telemedicine, online distance education and video conferencing.

Internet and telecommunication infrastructure plays an important socio-economic role in Indigenous communities and it is crucial for the maintenance of health in remote First Nations communities (Carpenter, 2004; J. R. Fisher & Campbell, 2007; McMahon et al., 2010; Mignone & Henley, 2009a). Broadband capabilities support the streaming of large chunks of data such as video and voice and could be used to provide education services. The Canadian geographic landscape is vast. The population is thinly spread, particularly those in which most Indigenous communities are located. There are broad distances with unmanageable terrain that challenges the implementation of stable broadband internet/telecommunication infrastructure. This geographic challenge makes it extremely costly to provide telecommunication service to remote communities. These communities are small and the market demand from them is often not large enough to justify investments for good and stable telecommunications infrastructure. The Manitoba Telecommunication Service for instance, provides the “backbone” infrastructure to remote communities in the province. It is called backbone because it provides the underlying infrastructure on which other services are built.

Cost remains a factor, although regulatory mechanisms by the Canadian Radio-Television and Telecommunications Commission such as those that permit the sharing of resources by competing telecommunication companies, have somewhat helped in keeping cost at an affordable level, at least in the voice segment. However, in the data segment the cost of implementing technology such as broadband that can enable value added services has been too high, thus preventing its implementation. Cost remains exorbitant for the average community member,

The reality of serving sites north of Thompson is [that] the majority of them are served at a loss. And the biggest challenge is from a cell service perspective, once you get north of Thompson, [they] are not [within] the cellular facility (Participant Q).

I captured the mobile broadband internet challenges on the very first day of my very first visit to Bunibonibee Cree Nation in the following reflection:

The first thing I did as we taxied to a stop at the Bunibonibee Cree Nation airport was to switch on my phone in search of a signal. I wanted to know the extent to which wireless mobile radio communication access was available. Of course, I was exploring the implications of the feasibility of mobile mediated adaptive orienteering. There has to be mobile signals present. How else would students be able to undertake the outlined activities, which were very mobile intensive? I was shocked. There was no signal. I had no means of contacting family and friends who might be concerned about me going this far north.

My host picked me up from the airport and took me to the facilities. In our sporadic discussion, I discovered that:

- *Galaxy Wireless (a private service provider) provides bandwidth to the University College of the North center. The center spends approximately \$2500 per month on bandwidth purchase.*
- *Bandwidth is provided over satellite.*
- *A LAN (Local Area Network) infrastructure had been setup at the University College of the North facility. It has a server room with shared server and print services.*

- *A computer lab with 17 computers were all interconnected to a local printer which students were able to use to produce online content and materials, and to conduct research and other course related work.*
- *Several other institutions in Oxford House also purchase bandwidth from different service providers. It is unclear whether they do so from Galaxy. But my host is setting up meetings with the other groups to determine what their cost of bandwidth is and who pays for it. Other users include the nursing station that has a video conferencing facility must have quite a high bandwidth capacity for it to be able to provide such service. The Airport also has its own service provider. And so does the high school.*
- *MTS currently provides mobile CDMA service to the community. The possibility of switching to and roaming on this signal is non-existent for me.*
- *There may be a possibility of forming a bandwidth-negotiating consortium to negotiate downward pricing on the community bandwidth with a single service provider.*

I was surprised that cellular infrastructure in this community, in a developed country, was far less developed than in some of the African countries in which I had worked. I understand that many factors determine technological deployment in Canadian communities, yet I remain baffled by the lack of infrastructure in Bunibonibee Cree Nation.

This lack of suitable infrastructure translates to cost that is downwardly applied to the community members in Bunibonibee Cree Nation. For instance, community members who occasionally traveled to Winnipeg to receive medical attention tend to pay a lot more for medical consultation services than they usually should. When they traveled, they paid the cost of plane

tickets, and hotels and feeding for themselves and at least one relative who was required to provide assistance while the patient received medical attention. The cost of this operation is usually high. It could be avoided if there was a functional telecommunications infrastructure that permitted remote diagnosis to be performed. One participant highlighted this importance as follows:

The same thing here, we have tele-health and eh...we are able to have [a] doctor in Thompson [not Bunibonibee Cree Nation] examine an elder here in the home. We have a stethoscope and we also have to prepare heartbeat and all that. We hold back every thing, and the doctor in Thompson and Winnipeg actually listens to the resident's heartbeat, able to use the camera in their throat and all that to do a complete physical as you would in the doctor's office...And that potential is there and we are starting to utilize [it]. ...And I know that the government in our community [Bunibonibee Cree Nation] spends a lot of money sending people out to Winnipeg and Thompson for medical appointments. Many a times these appointments consists of these patients going into the doctor's office, doctor says, 'how are you, everything is ok', and the appointment is finished in less than 5 minutes. And the whole trip costs up to \$2000. The cost of aid and the cost of an escort, you are looking at 3 or 4 thousand. And that cost can be avoided (Participant N).

Participants felt that the availability of a working telecommunication infrastructure could have helped to address the challenges they faced resulting from the high cost associated with medical related travels. Available infrastructure could have helped to substantially reduce the need for long distance travels for simple medical checks for themselves and their helpers. Clearly, there is an opportunity here for digital technology to play a significant role (**Determinant:**

Available digital technology could help to narrow the medical services gap and to enhance learning).

Access to medical health facilities is a determinant of health. Similarly, access to educational resources is a determinant for successful learning in an Indigenous context. Digital technology that is available and affordable can improve student access to educational resources. Availability of resources may determine whether students in the community would continue schooling in the community, seek alternative schools outside the community where resources are available or even quit completely. In much the same way as the unavailability of quick access to telemedicine is underlined by accessible telecommunication infrastructure, so is access to knowledge that empowers learners in the community affected by accessible telecommunications infrastructure.

In the meantime, prior to the availability of a suitable infrastructure, an approach to address this disconnect may be to explore a more robust method of collaboration and cooperation (see next section). Organizations that require a suitable infrastructure to deliver value added services could collaborate, harmonize their infrastructures, collectively negotiate a single tariff, pay a unified cost to a single service provider and then split the services to the different agencies in the community. This approach will involve a broad spectrum of stakeholders where infrastructural challenges could be discussed and addressed. It could produce homegrown solutions that are innovative and that are generated by individuals who are specifically affected by the “disconnects”.

The lack of individuals with the capacity to foster this sort of cooperation and collaboration may be challenging. For one, they would need someone with the technical knowledge to negotiate on their behalf and the various agencies may need to articulate their

specific telecommunications requirements (**Determinant: Available individuals with technical knowledge** could be helpful in articulating the technical needs of the community and in fostering good collaborative platforms).

Without the capacity to set up these structures, a consortium may be impossible to create. An individual with the strong technical knowledge and who understands the needs of the community may be required. Identifying this person or persons and putting them through the necessary technical/technological training may take a while. It would initially require someone that is willing to go through highly technical training and who will continue to remain in the community. This sort of effort that could produce gains in which the community benefits takes time. However, in the long run, this can be achieved. This way, cost could be reduced and the many independent arrangement with a single service provider could be unified, easy to manage and could result in profitable outcomes for the community.

b) Community Disconnects: Mechanisms for collaboration and cooperation are largely absent. A platform for dialogue, collaboration and cooperation, and a mechanism for on-going discussions between various stakeholders should be present.

Most of the participants in the study indicated that there was a need for a platform for ongoing dialogue, collaboration and cooperation among various community members (**Determinant: A non-hierarchical platform for dialogue** is useful for sharing knowledge and for collaboration. Education could significantly benefit from this platform). There was no such platform at the time of the study. Most participants felt isolated from the decisions taken about their education and those of their children. For instance, one participant felt he had lost control of how community education was being done and how it should be done. In one instance he

highlighted the disparities in the educational funding models and support structures. He mentioned that some learners were funded by the province and others by the federal government

Yeah, like - yeah. There's been a lot of discussion over the years about how education should be happening in communities, and there's that - where that keeps coming out is [in the area of] community control. Control by the communities themselves. And that really hasn't taken place because the system itself has to be regulated by the national government. So, every time we tried to evaluate the education system, it's still [bad] evaluation. And they come in here and right now I would call our system an Indian Affairs system. That's what I would call that. Not an Indian system. An Indian Affairs system... There are two different things here. An Indian Affairs system is where Indian Affairs, the Department of Indian Affairs is the boss. Community education and community law control is where the community is the boss. And sadly, when every time there's comparisons done there's a big disparity [...] In terms of, I'd say the funding part. We only get - the Frontiers get, like, five times more funding than we do firstly. I don't know what the figures are really at this point but it's something like if my schools get \$200 per school, Frontiers would get \$1100 per school. There's a big disparity there (Participant Y).

Clearly, funding disparities existed in the Frontier School division. This school division is partly responsible for education in the study community. The disparities created some form of fractures between learners who had been funded provincially and those who had been federally funded. This has always been the case (Graham, 2017). Parents of children who felt they were on the short end of the funding stick felt they needed a common platform on which to air funding issues and on which equitable dialogue could take place. Parents wanted to be given an

opportunity to contribute, not just to the pressing areas where and how funding could be applied, but to the overall shaping of their children's education. One participant said,

So hopefully the sign of those processes will be such that contents of the discussions will be - something that the parents will understand and...have their input into it. [...] And there was no parallel process where the community would be given a chance to ... to have to analyze the whole thing and be able to say, 'here's a piece that's not working. Here's something that needs to be revealed and put aside or something. Put it here or there'. And to do that I think the community - the people have to ... feel welcomed to do that. They have to feel invited to do that. And right now the attempts that have been made have not produced anything in terms of making people feel invited. That they need to take part. And that's because - oh, I can't take part because that person said it has to do with way up there, and I'm down here (Participant Y).

Community members wanted to feel invited as critical evaluators and contributors that could help identify challenges and shape educational structures of their children. They needed a platform with leveled hierarchies and on which everyone could speak on an equal footing.

I think it's - I think the community has to come together with the school and talk about this. I think probably right now is a very good time because of the fact that there's going to be a change in terms of what resources are going to be available to the school. We can go in there and say ... and say that 'the reporting system is not working'. That 'the report card system is not working. The parent teacher day's not working'. The...the school [is] very rigid structurally - the way it's structured, too rigid. There's a percentage of students that don't want to sit in a classroom because it's too rigid. The system is too rigid. And therefore the school doesn't have to be considered in a different way. And we have to find

out together. I think we got [to] look at more of a parent involvement even to a point where parents would make a lot of decisions [about] how the school should be run. We see where there's a – [five] principals [in the] school in five years (Participant Y)!

As community members desired mechanisms to mend disconnects, they felt that technology could play an important role in facilitating connections between them. Digital technology could be used to enhance communications. In this way, digital technology could help to establish “connects” between community members while at the same time providing a platform for dialogue, collaboration and cooperation. The possibility of digital technology to create connects is discussed in more details in the Affordances section. For digital technology to help in this way, underlying assumptions about pedagogy and culture may need to change.

c) Pedagogical/Cultural Disconnect: For meaningful learning to take place, and for cognitive shifts between Eurocentric and Indigenous cultural ways of learning and vice versa, to occur, existing pedagogical and cultural disconnects should be addressed.

Another thread that was common across most participants' responses concerned the pedagogical and cultural disconnects that they felt. Most participants suggested that digital technology had created disconnects between them and historic traditional practices. For instance, young persons seemed to engage in far less outdoor activities because they spent more time indoors on computer games and other mobile applications, far less time discovering things on their own and in their community and far less time discovering things through hands on experience on the field. One participant described it as follows

Probably, some of it has to do with technology. It's...strange...With the kids one time, out on the lake when they were having an outing...we got some students in Grade Six and they were telling me about all these [video] games they played, and I said, ‘You know I

wouldn't even know...I don't even know what you guys are talking about. All I know is what we did in the summer. And when we were kids, this was playing games outdoors, outside. And when we made our own...whatever we wanted to [make], we made our swings, we made our own slingshots, we did everything'. We were more...like learning to do things for ourselves and we didn't have to rely on technology like the way they do [in] this...generation...Now people are going to find out how to do something, you just Google it (Participant X).

Older members of the community felt that the use of digital technologies such as social media on mobile devices had created disconnects between the youths and Indigenous knowledge that had been passed down from generations. For instance, visits to families had reduced because it was somewhat easier to communicate over social media than to physically conduct a visit. Social media had also affected the sharing of information between and among community members. It had challenged existing cultures in that condolences, which were previously expressed in person, through visits with the bereaved, were being expressed electronically. One participant said,

That's it - yeah the elders don't know how to use [social media]. Like they text their family members and those kinds of things....Some of them even have Facebook too... If they...want to say something...[or] whenever there's grief in the community, whether somebody passed away... that's one of the ways people acknowledge and give their condolences to the family and like [on] Facebook. It's not like in the old days we used to go and visit each other and [...] and that thing died down. [...] It's slow - I've noticed that actually. I went to a wake at - a wakes we'd have before the funeral...there's not that many

people attending any more. Even the elders that used to do these things, it's dying down (Participant X).

Participants felt that education as it was presently implemented did not sufficiently include aspects of the local culture in a manner that dealt with these types of disconnect. (**Determinant: Culturally appropriated technology** that connects learning to Indigenous cultural and Indigenous culture to learning is appropriate technology). They wanted learning to involve more outdoor activities. Comparatively, they felt most of their learners had far less outdoor time than they did:

And our culture was not - there's nothing included. We - I remember a few times when I was going to school that I would actually fall asleep because it would be so quiet in there. All the kids would be doing what they're supposed to do and then I would hear this outside, "sssss", the wind blowing and I'd fall asleep.[...] (Participant Y).

They commented on the absence of cultural pedagogy related to interacting with the outdoors and the impact that such activities could have had on their learning.

I was telling them, 'You know you guys, like when we were kids we - all we did was pretending and [...] - a lot of stuff outdoors and from there, and the handling skills we learned when we were handling birds and how to sneak up on animals and you guys are not learning that, you're learning to play [video] games. [...] Like I could still name all the birds in the tree, the ones that we have around here (Participant X).

This elder felt that students in their classrooms lacked more confidence, survival skills, patience and independence because they were not given the opportunity to learn these skills in the classrooms,

Yeah, maybe the things that we - in areas where kids can...could learn the doing of things by hand and...like let's say when we were young my dad used to take us to the trap line, all of us boys went through that ritual, we learned to survive in the wilderness and we learned to survive and live off the land and we learned that stuff, and at the same time we learned to be patient and...independent. You can learn that stuff and so you feel more proud of yourself if you can [prove] all these things and today I see kids are... I think kind of lost in-between these - like the way their parents grew up and they...they're growing in a different way. (Participant X)

Another participant who was a current student corroborated the last elder's comment by suggesting that,

So my first year, my first year was very challenging...[such as] growing up in the community where they don't practice the traditions. That's one thing I never saw growing up. I didn't see *pow wows* or the drum. I heard people talk about them but I wouldn't see anyone practicing them. So my first year, it was kind of different emotions I'll say (Participant O).

This observation indicated that there were pedagogical disconnects in their curriculum because it did not recognize some of the Indigenous cultures that they were used to. Participants who were engaged with the activities of the study indicated that they were able to relearn certain aspects of their culture that they had forgotten. It would appear that pedagogy that brought aspects of their culture to remembrance was important for learning to take place. By unearthing these aspects, they were able to culturally reflect on their learning. As a result, they began to realize how these aspects could help them to repurpose, restructure, reshape and re-appropriate their appreciation of culture.

I learn a lot about things like my native culture. Like it has affected me in so many different ways. Like when I first started this program... like I didn't really quite know that much about my culture, and ever since I started this program it has been a real eye opener (Participant A).

The use of digital technology seemed to have created disconnects and connects at the same time. Participants felt aspects of their culture were gradually changing either positively or negatively and they had little control over these changes. Participants who had been taught about their culture did not seem to make any connection between the content and their culture until they embarked on a learning process that enabled them to question aspects of the culture and to make meaning of their findings. Perhaps the exercise of creating digital artifacts helped in some way to focus on the responses they received from their elders or to narrow down to the cultural changes that they were beginning to experience. It seemed that technology that allowed them to focus on their culture helped them to learn more about it. It certainly raised awareness of some of the pedagogical disconnects that existed in the community. It also seemed that the ability to question aspects of their knowledge of culture enabled them to become more aware of the gaps that existed in their learning.

Under this theme of technological, community, cultural and pedagogical disconnects the following important determinants emerged:

1. **Suitable digital technology** could enhance value added services such as tele-medicine.
2. **Individuals with technical knowledge** could be helpful in articulating the technical needs of the community and in fostering good collaborative platforms).

3. **A non-hierarchical platform for dialogue** is useful for sharing knowledge and for collaboration. Education could significantly benefit from this platform.
4. **Culturally appropriated technology** that connects learning to Indigenous cultural and Indigenous culture to learning is appropriate technology.

Besides the “disconnects” highlighted here and the “connects” to be discussed later, there appeared to be evidence of socio-cultural challenges among primary research participants.

4.4 Theme 2: Socio-Cultural Challenges to Digital Technology Implementation and its use for Education

It would appear that participants were making inferences about their culture from historic knowledge that they had received through intergenerational sharing of knowledge such as story telling. Arguably, some of their historical knowledge had been influenced by happenings in their community such as the loss of loved ones. Participants seemed to question the knowledge of their environment when a tragedy happened. Some of these happenings produced socio-cultural impacts that significantly affected them and their learning. It would appear that attempts had been made by participants to protect themselves from further hurt by creating a safe frame to guarantee their privacy. They wanted a frame that provided assurances of equitable relationships in the community.

a) Culture-based reasoning: The ability to reflect on past stories and to leverage the knowledge generated to navigate complex cultural situations. (Determinant: Technology that enhances culture-based reasoning could help participants to navigate between Eurocentric and Indigenous worldviews).

A notion of technology ecosystem was previously described as consisting of people, tools, and the systems within it. Even though participants were a part of this ecosystem, they appeared to

be reluctant in the use of digital technology for reasons of security such as hacking or loss of identity. They appeared to have created differences in the various contexts in which digital technology could be used. Tools that were used at home could not be used at school and vice versa. They appeared skeptical of applying digital technology to their learning environment, even though they may have used the same technology at home. One participant said:

Yeah...They're afraid of hacking, yeah, so they think if they're on there, everybody can see them, you know? They have a phobia that, say, 'if they turn on the computer like this, anybody in the world can see it'. [Laughs] But it is possible, but it's not going to be (Participant M).

This phobia of digital technology and the fear of conducting transactions online, though changing, used to be common across Canada. Over 76% Canadian households shopped online in 2014. Canada Post saw growth in parcel delivery from online stores to homes rise by 37% in the first quarter of 2015 compared to the same time in 2014 (Friend, 2015). As consumer confidence grew, growth of online transactions also grew annually. Arguably, consumers might have compared the convenience of shopping online with assurances of safety. They might have decided which risk was greater to determine whether or not to continue transacting online. They were likely to wonder if their online identity is safe, and that the companies with whom they performed business guaranteed their safety and the safety of their investments in the company's product or service. Most companies that provide online services tended to extend assurances to their clients through licensing agreements, which they expect their clients to read, understand and comply with. Arguably, most consumers do not often read or even understand the end-user license agreement (EULA). Some consumers might sometimes take them for granted (Bakos, Marotta-Wurgler, & Trossen, 2014).

A recent study showed that of the nearly 50000 visitors to a website of 90 software companies monitored in a one-month period, “only one or two in 1000 shoppers accessed a product’s EULA for at least 1 second.” (Bakos et al., 2014, p. 3). This number amounts to an abysmal 0.2 percent of users who view but do not read the licensing agreements and end up using the software. These license agreements are often several pages long. A one-second glance cannot certainly guarantee comprehension of the terms of the agreement. There are a number of reasons why consumers behave this way. Amongst them is the fact that most of them do not understand the terms of the agreements. While a majority of participants in the study agreed to the low probability that adverse effects could result from the use of the products and agreed that by reading the license agreements they would discover this, they still chose not to read them either because the agreements were often too complicated for them to understand or they did not feel the need to do so.

Despite this position, participants in the study appeared to be critical of any digital technology that was introduced to them during the study. It seemed that they did not want to read through the end-user license agreement for any of the applications on their mobile devices or devices that they used for project activities. They would rather, almost by default, refuse its use and then only through some form of reasoning which seemed to be based on an understanding of historic knowledge were they able to determine whether or not it was safe to download, install and use on their devices.

Safe use of digital technology tools appeared to be an important aspect of the safe frame that they had constructed (**Determinant: Safe digital technology and safe use of digital technology** could help to facilitate learning). Even though they may likely have used the digital technology in question, it seemed that the participants questioned its use by reasoning about its

potential for personal safety, its potential to not negatively impact on their culture and its potential for safe use. Participants seemed to question the fact that an outsider researcher was involved in its use and that his involvement, in and of itself, raised questions of safety and confidence. The consideration here is similar to the philosophical question about a tool's incapacity to do harm all by itself but that the same tool could cause harm in the hands of a potentially harmful person. In this case, the tool, its proponent and the users were under scrutiny.

For learning with digital technology in this context to be successful, the participants have to establish confidence in the educator or researcher. This perception of confidence is an essential component of the safe frame.

i) **Safe Frame:** One participant was very clear about building confidence in the persons that use the technology when he said

I think ... talking to you like this; I think my feeling's that I will help you. But I want to make sure at the same time that we benefit from what you're doing. (Participant Y)

As a researcher, the willingness to “give back” to this community carried significant importance, as was earlier reflected in chapter 1. This willingness to give back appeared to be an important policy and guiding principle for working in this community and it appeared to be the password for access to the community's safe frame. It was also an assurance to the participants that they could establish confidence in the researcher. (**Determinant: Feelings of safety and assurances of confidence** in the use of digital technology can solidify the safe frame). A solid safe frame based on such assurances is necessary to enable participants to feel safe about their learning.

The application of digital technology in the research context had to be done in a safe way and in a manner that its implementation was preceded by consultations with members of the

community including parents, teachers and elders. This study also built upon the promise to give back to the community as outlined in the Integrated Knowledge Translation framework (CIHR, 2012) for conducting research in Indigenous communities. This safe frame was strengthened by the long-term efforts of creating relationships with community members. In the absence of this safe frame, the study risked losing community buy-in.

There was need to be mindful that the application of digital technology could undo this safe frame, as one participant reflected,

But it's hard to step away from - I just explained to you before anything - any technology that came into the community. I feel [there was] still [...] a time when we were much safer and much happier. If somebody is interested in learning about the culture ...- it's going to take a long time. I keep saying that to a lot of people that I was happier 40 years ago than I am now because when I viewed back there was more of a good feeling about somebody who made me feel that I'm going to be safe (Participant Y).

Arguably, some of those who lived in urban areas with better access to information and communications technology may have learned to avoid security mishaps and safety pitfalls associated with the use of these technologies. Most urban residents are likely to maintain stronger security because of their likely knowledge of the risks associated with the use of malicious software. Some of these risks include phishing, online scams, malwares, and ransomware. Individuals with more awareness are likely to take the necessary steps to avoid these risks. For instance, they may apply security updates fairly regularly. A case in point was the 2017 ransomware attack on a large proportion of global computers (CBC, 2017) in which users were requested to pay \$300 before their locked computer screens and encrypted data could be released.

Users who were likely more aware seemed to avoid further risks by learning from the mistakes of others or simply by accessing information that improved their knowledge about associated risks of malware. However, those with lower levels of awareness or lower levels of digital literacy would be at risk of these scams, such as those living in rural areas where information about these kinds of risks have not reached. The outcomes are likely to be costly for those who are less aware.

Participants in the study community, even though they were not immune from these risks, appeared to avoid them somehow. It seemed that culture-based reasoning rooted in the stories they were told, enabled them to find ways of avoiding risks and to develop individual confidence related to the use of the specific digital technology. This participant, an elder in the community, highlighted his initial apprehension, but subsequently indicated a gradual but increasing confidence in the use of the computer

Yeah and all of this, the computer age came in and this... one I could never really get to latch on... People who are using the computer mess it up... and I'll do something terrible to it but I'm starting to feel comfortable with it (Participant X).

Participants who exhibited a lack of confidence in the use of the digital technology had done so because of the stories associated with negative unintended consequences related to its use. With the recent upgrade on the telecommunication infrastructure, users were able to use data services on their mobile devices for the first time in the community. The increase in cyber bullying seemed to be an unintended consequence of this upgrade that also seemed to threaten the safe frame in the community.

Despite the consequences, participants exhibited some form of culture-based reasoning to decide whether or not they would use digital technology for their learning. They were able to

recollect frames of reference created by stories of mobile usage in the past. Stories they heard from the past about the maliciousness of digital technology from family or friends helped them to determine if the technology was safe for their use or not. As they reflected on the application of digital technology on their learning, within the context of the safe frame created by their own reasoning, they are likely to continue using digital technology for their learning if the instructor provides assurances of giving back to the community and if the instructor reassures them of safety. One participant reflected about these feelings of safety and confidence during the process of acquiring consent from the Chief and Council who had insisted that they must understand the implications of the study before granting consent

So I told Chief B [member of Chief and Council, name withheld] about it and he didn't want to sign it at first... so he said, 'I want to learn more, can you give me an outline of the [study]'. So I told Y, and Y gave me the [outline]. So I went back to him and he looked it over and said it looked good (Participant A).

The aforementioned community leader Chief B initially refused to sign the consent letter required for the study to commence because he was unclear about the extent to which digital technology would be used in the study (he was initially told that the study involved digital technology).

Although he was reluctant at first, he gave consent as soon as he understood the purpose of the study, supported by promises to give back to the community and assurances of safety for him and his community members. The safe frame was reconstructed to include his consent. Another participant reflected on this feeling of confidence and safety as follows,

Now there [are] a lot of things happening that take away that kind of confidence. [...]

Even though I was in grade 9 there was still a way to build a rocket, but it didn't happen

because the right support was not there. And that - that scientist... like you, coming to me... and I could figure out and show you how, 'here's where you take the most common medicine that we use. And here's how we do it'. And I could work with you that way without any big issues about first having major education or first having to look through a process that the [authority] requires. I've seen that many times (Participant Y)

It seemed that the ability to reason culturally helped participants to understand the implications of digital technology on their culture, and the impact of digital technology in shaping their community (McLuhan, 1994).

Some participants, who were concerned about hacking, were able to decide whether or not to express confidence in the affordance of digital technology. By reasoning like this, they were able to decide if the affordance of digital technology far outweighed its maliciousness and if they could subsequently risk using it. For instance, they described the affordance of digital technology for preservation of knowledge and for recording history,

We got recordings and saved them. That part of history will be saved and not lost, our children's children, grand children, great grand children... Hey, it was my grand mother who said this 20 to 30 years ago. Technology is...there are hardly any boundaries now (Participant N).

It was clear that a safe frame was required in the use of digital technology for learning. Participants also indicated that a component of this safe frame should include assurances of privacy.

ii) **Privacy**: Another important aspect of learning with technology in this community was related to their perceptions of privacy. One participant highlighted that

We have to look at privacy. So all these things [distance education, tele-health and other remote services] would have to be addressed (Participant N).

Participants wanted to feel confident about the digital technology that they used and for which guarantees of privacy had been given. This participant indicated that

Even though we are willing to share information, it should not only be about trusting the tools to do what they say they should do but to also maintain the privacy of the tool's user (Participant N).

Privacy was an important consideration and an essential element of the safe frame especially for the primary research participants who indicated that they were apprehensive of losing very personal information online. This leads to another determinant; **Determinant: Guarantees of Privacy** could enhance learners' willingness to use digital technology for learning. Participants were initially unwilling to participate in the study's activities even though they had granted consent. Activities such as creating a blog post, posting a picture of their community online, creating a tweet, or engaging in public conversations on social media platforms were avoided because they felt that they often revealed aspects of their community or their personal identity. One participant expressed this lack of privacy by describing how she was cautioned for sharing information online:

[I] remember going home all the time and I would talk about these things and I would share them with my children, my husband, just everybody that came to visit me, everybody I was around. But still my family would be um... would say, be careful, be careful. Like just things like that (Participant O).

Participants seemed to be reluctant to use digital technology to share information about their community and themselves because they felt that it exposed them and their community to

potential harm. The use of digital technology would require guarantees of privacy both to the learners and their community.

Another important element of this safe frame concerned the feelings of equity, particularly between cultures and worldviews.

iii) **Equity:**

Participants thought that equitability in perception of Indigenous culture and Eurocentric culture was essential for learning to take place in the community (**Determinant: Assurances of equitable perception** that make participants feel that their Indigenous culture is perceptively equal to Eurocentric culture would facilitate learning across worldviews). Participants felt that power relations were present in their current learning contexts and that religion that historically dominated Indigenous culture played a role in perpetuating power imbalances. One participant mentioned:

But I think my nation... my culture is just below that [the Eurocentric culture]. That's why what those people [historically domineering religion] did, some people see as magic, but its actually power. They must - the Creator would have that power, so we were - we were put not that far below our Creator (Participant Y).

Several participants stated their personal views about the role that these historically domineering religions played in creating inequality between their traditional and Eurocentric methods of learning. They felt that this type of religious interference undermined their cultural identity. This act of undermining cultural identity seemed to influence whether or not they were willing to participate in the study. This perception heightened their scepticism about the intent of the study. It seemed that they associated research and learning in the classroom with Eurocentric

methods that had the potential to undermine Indigenous ways of learning and knowing based on historical facts (TRC, 2015).

Perceptions of equitability are important for learning to take place. If Indigenous learners perceive Indigenous ways of learning as equitable with Eurocentric ways, they might appreciate them differently and might be willing to transition to Eurocentric methods that involve learning in the classroom. This change in perception might be necessary for cognitive movement to take place between both worldviews.

Through a process of Indigenous culture-based reasoning undertaken in a safe frame, participants indicated that the presence of a safe frame, privacy and equity were important determinants for learning to take place and for movements between worldviews to occur.

Another significant socio-cultural determinant to digital technology learning concerned the impact of trauma on learning.

b) The Impact of Trauma on learning: Trauma impedes cognitive movement. (Determinant: Recognition of, and Strategies to Address Trauma in planning and delivery of educational/technology program, is essential for teaching and learning and for cognition to take place).

At first, most participants were unwilling to express their concern about their personal experiences with trauma and whether trauma affected their learning. When initially invited to participate in the research activities, participants were reluctant to engage with me and to undertake the research activities even though they were physically present. In addition to the aforementioned concerns, their unwillingness to participate, I attributed to the extent of the personal trauma that they had experienced prior to, and during the research. As assurances were made for safety, equitability, privacy and as these led to increased confidence in the research

process, participants became more comfortable with the activities and subsequently began to share some of their deepest and in some cases, traumatic experiences. One participant described her traumatic experience related to the death of her grandfather during his last moments at the hospital

And then I said, 'No I can't, I want to take you home first', and when the doctor told us that he's not able to do anything to cure my grandfather anymore, then I asked him, 'Can I take him home then?' And sure enough, because he wanted to come home, and he said, 'Yes, you can take him home'. So [I] spoke with [an elder] that day and told [him that] I want to take my grandfather home and take care of him, you know, till it's time to go, and then he said, 'Yes of course'... And so we brought him home...and that night just before midnight he passed away (Participant O).

Consequently, as relationships were developed between the participants and me, they continued to describe coping strategies, which they had formed. They coped by leaning on the support of family and other community members especially during traumatic times:

You know when we're going through a difficult time we all come together as a whole group. And you know I feel that that's one thing that should continue (Participant O).

My initial perceptions of the impact of these traumatic experiences on the study were captured in a field note

I missed my 8:30am flight this morning but made it for the 12:45am flight. Arrived Bunibonibee Cree Nation at 3pm after a quick stop at Gods Lake Narrows for deplaning and boarding of passengers [...]. I arrived at the center, got the keys and moved to the lodge. Returned to the center at 4pm, ready to go for my 6pm session with the participants. [Another instructor] came around and we talked again. There had been a couple of deaths in the community, suicides, one of a close cousin of a participant. One body was flown in

from Winnipeg and it was likely that most of the participants and the community will be at the airport to receive him/her – sometime around 7pm. It appears, as a result of the death, that no class would hold tonight even though one of the participants had arrived at 6pm prompt. She waited for some time. I chatted with her. We discussed the recent loss. She seemed sad and was clearly concerned about her colleagues who would be at the airport. She eventually left. An hour later, another participant arrived. He had not been around. I told him no one except the other participant had been here. He also mentioned the airport and then promptly left.

The challenge of working in this community resides not only with the disposition of the students but with the trauma they suffer and the many past traumatic experiences they might have had. There has been at least a death within every week of visiting this community. There have been two in the last 10 days. And whenever this happens, everything shuts down. The schools close, the community withdraws, and the normal course of things is disrupted.

Trauma in the community was frequent and deaths tended to happen fairly often, usually the passing away of an elder or the death of a youth through suicide. One participant described this as “extended trauma” and most times, researchers and fly-in educators were unaware of the traumatic experience that students or research participants were experiencing. As a result, expectations for performance may have been inconsiderate and may not have reflected any consideration of the trauma that students and participants experienced. Further, students and participants were unwilling to express these concerns until a safe frame had been established and stronger relationships had been built within the context of the safe frame. Arguably, this attitude could be initially extended to outsider educators who teach in the study community. One

participant captured trauma, not only from the context of death in the community but also from a broader concept of the impact of colonization, religion and residential schools. In this form, trauma was more entrenched than the occasional loss of a loved one

I think the most difficult thing for people in general and really important for researchers to look to is the trauma, the ongoing effect of colonization, Christianization, residential schools, systemic colonization all of those things, many of which were not necessarily done with bad intent. That particularly... I'm saying the more recent things, but again, how is it perceived and what is the impact on people? So, if you have not really experienced trauma in your personal life, have not been around extended trauma in large groups of people then there is still much that is difficult to understand. And I think that's one of the most critical things for people, at least to see that they don't [appreciate it]. You know, I am not wishing trauma on people so they...have that experience of it, but to be aware of it. And I think in your visits here, [this] may be something that you're just starting to really appreciate (Participant R).

This broad conceptualization of trauma beyond the loss of a loved one was significant and was a necessary consideration in the process of learning and doing research in the community. Thus, educators or researchers should seek first to have an appreciation of this state and then choose to be considerate as they make plans and decisions concerning participation, schedules, deliverables, requirements and expectations for participants and students' engagement in learning or research.

As a researcher and an educator who would like to continue engaging in the study community, I had to adjust and assume an empathetic level of appreciation of the traumatic experiences of the study participants and to allow this appreciation to continually guide my

interaction with them and other members of the community. This level of appreciation was captured in a field note, which captured my personal feelings

Be willing to adjust as you realize the presence of trauma, empathy within a framework of a newly adjustable timeframe peppered with patience. And so, I get what you [my interviewee] are talking about. You wouldn't see that if you were not here, you wouldn't see that if you were not in community. [You would] not understand some of the challenges that they were going through, things that may appear to be glaring, but are not. They're more hidden than visible. People don't talk about their traumas often, they go through a lot, but you don't see that. And so, that preconception from a western perspective of the way education is structured could be readjusted and repurposed to this reality. Planning items such that, "from this time to that time, we will do this", "and because "we didn't start at this time, therefore, we will do more at another time", may require some rethinking. We may do a lot of planning without complete understanding and full consideration of the contextual reality. When I was planning the visit to Bunibonibee Cree Nation, I made a lot of plans about all I hoped I would be able to achieve, but when I got here the realities on the ground changed everything. You do what you can do with the time that you have and make sure it works as best as you can with what you have, I think that's key.

As a researcher and educator, expectations had to be adjusted about how learning, be it culture-based, Eurocentric or technology-mediated, can best be facilitated among learners in this community. Arguably, the requirements and expectations for promptness and scheduling that an educator would normally have might be significantly different from those expected in the

Indigenous classroom. Another participant reflected on the amount of effort that participants who were students in a university-based program put into their schoolwork

The things they have to go through and yet make it to class. I guess we were talking about students who are working all day and taking all these course on top of that and have families besides all that, just regular, besides all the different traumas, so we're talking about really dedicated students even though if you say it, it may not have the look of it (Participant R).

It appeared that the typical Indigenous student exhibited strong elements of resilience and courage in the face of the trauma that they experienced and continued to experience, their familial responsibilities, technological challenges and all other gaps in their community. Despite these challenges, they continued with the requirements for school. Another student reflected on this show of courage and resilience while we were waiting for other participants to arrive

And, you know, when there's been a suicide of a 15 year old less than a week ago, that funeral's gone. And then another suicide of a 26 year old and the body went...and there is [a] wake and the funeral is today. So, that's why they're not here today. But come later, the fact that they came and... when they came they really did want to learn. But it would be just so easy with an attitude to say, 'oh well, that's going on just go'. I mean, this fine line that you speak [of], it is just making it okay for them, [and] at the same time is encouraging them to get a little piece out of it (Participant R).

For an instructor or educator who may be involved in learning, teaching or research in Indigenous communities, an acknowledgement of the trauma that their students or participants experience and a reflection of this acknowledgement in the teaching styles, methods and

approaches to learning, is a significant determinant required for learning, and for cognitive movements between worldviews to occur.

While this thesis has attempted to explore learning from the learners' perspective, it has recognized that learning also involved the role that educators played. It recognized that the learners' socio-cultural context is important for improving the learner's awareness of their culture and for improving the learner's access to knowledge. The educator should develop pedagogical strategies that could result in long-term, systematic approaches to learning that recognize the learners' culture.

c) Pedagogical Strategies in the use of educational technologies: Pedagogical strategies that reflect Indigenous culture may be a requirement for cognitive movement.

Carefully designed instruction is essential for learning to take place (Garrison & Vaughan, 2007) and by extension, it is a requirement for learning with digital technology. Carefully examined pedagogical practices could ensure that learning structures involves aspects of Indigenous culture, and that educators use Indigenous culture as a basis from which to scaffold student learning (**Determinant: a Firm Indigenous Cultural Learning Base** is required on which scaffolding of other cultural forms of learning, including Eurocentric culture can be developed. This idea of Indigenous based pedagogy is not new as participants in this study were known to learn through strategies that involved more than reading and writing. One participant suggested that historically Indigenous culture-based learning had encompassed more than reading and writing. She suggested that there had been a shift from the useful core elements of Indigenous culture-based learning to the Eurocentric ones that learners currently experience in the classroom:

Historically, it would appear that the focus on reading and writing shifted the gaze away from listening, speaking, viewing, and representing – [these are] essential elements in learning (Participant R).

The elements of “listening, speaking, viewing, and representing” which this participant mentioned seemed to be aligned with the community’s Indigenous culture-based learning strategies that Mitchell (2012) described. According to Mitchell, in the Cree belief system, they are “taught from a very young age to walk, communicate, and interact with multiple worlds” (2012, p. 26) and that learning involved the entire being, causing “one to *become*... forever *evolving* and *becoming* as [they] go through various stage in life from conception, childhood, adolescence, adulthood, elder-hood and beyond into the spirit world (2012, p. 29). Indigenous learning needs to shift back to its holistic and all-encompasses aspects.

Pedagogically reflecting culture in learning is by itself a difficult task and the introduction of digital technology to learning in the community made an already difficult task even more challenging and complicated. One participant described the presence of gaps in the pedagogical approaches in the current learning context. She mentioned that the context did not reflect the cultural elements of learning, of being and of becoming which Mitchell referred

Okay, so technology actually has a capacity to bring back some of those ways of communicating and relating that fell into the background with the written culture. So for example and again, this is a teacher education program and my focus is on that, but to be a strong teacher you need to be a strong you. So, it's also on that. And [to] be in the school in the classroom...there is this tendency to focus so strongly on the written and the English alphabet kind of language arts for example, and yet even in, ...I mean the curriculum itself... it's listening and speaking and viewing and representing not just reading and

writing [that should be reflected]. There are only two of the six things and the viewing and listening and speaking and representing are totally in sync with cultural ways, not ancient culture but ongoing culture, way of being that isn't totally linked to reading and writing (Participant R).

Most importantly, it appeared that little thought had been given to how to utilize digital technology for incorporating Indigenous culture-sensitive strategies, contents and pedagogical approaches to learning – especially approaches that were appropriate for the community.

Students in the elementary school for instance were recently introduced to tablets which seemed to have been parachuted into the learning context and which could have produced more gains if holistic pedagogical and cultural considerations had been taken. One participant who was involved in that program mentioned that

They have iPads... They are used for reading and if there's progress, that software that's in there ... [is] for reading, math and other programs... for special needs... If we have a special needs student we have to run some different [software]. They were trying to bring up the Grade 1's so they would do better and [if] they moved into later grades, Grade 2, or so. [...] Students were not properly prepared when they got to Grade 1 specifically with their reading and name writing and stuff like that. So they brought these in to help the kids. [...] Oh I think it helped some but I wouldn't say a lot, but it did help and it does help and from what I hear from the - when the kids are moving to Grade 2 - they will be tested next this month or before the end of [the] month. You have already progressed - so we'll know when they do their reading test or evaluate their progress... The previous resources teacher that we had was good with computers and he could make those graphs and we do a test in September and test them before Christmas and test then around Spring Break and then test

them again at the end of the year to see if there's any [progress]...Some of them, the older ones, you can tell right away that it's not helping. [They are] the ones that miss a lot of school. But the ones that come to school, there's progress you can see. Even the weakest student that comes to school every day, he [made] progress (Participant X).

The tablet devices used in the elementary classrooms were locked down to prevent access to undesirable websites and apps. Locking down devices did not in any way represent the Indigenous culture-based pedagogical practices that participants were used to. They rather reflected a rigid approach to a highly structured and controlling form of learning. Whereas participants were used to learning through Indigenous story telling methods and within the framework of a safe environment that was less rigid; locking down the device seemed to highlight the lack of confidence and trust in the participants to safely use the digital technology. This is not to say that safety measure should not be taken. Rather that consideration for safety should align with cultural practices so that participants' confidence in the technology is not questioned. Access to devices at home seemed far less restrictive than they were at school. For this reason, elementary school students gained access to age-inappropriate content. One participant reflected on the age-inappropriate language used in some of the applications on their home devices, describing it as language not suitable for learning

Yeah and I think the games they have at home too, like that - like some of them have language that - like their older brothers have these games and they learn to play with them too, but the language on some of those games is not language that they should be learning (Participant X).

While this research did not specifically focus on elementary school students, there seemed to be gaps in pedagogical strategies concerning the use of digital technology for elementary

school learning. This form of learning shapes student learning and it is likely to influence their perception of digital technology at the secondary and post-secondary level. It is important that the introduction of digital technology involve Indigenous culture-based pedagogies at the elementary level also. Digital technology for learning, irrespective of level, could benefit from more Indigenous culture-based pedagogical strategies that emphasize aspects of listening, speaking, viewing and representing, towards evolving and *becoming*.

More effort is required to help shape the pedagogy of digital technology use in and outside the classroom, at all levels of education in the community. The application of Indigenous culture-based pedagogy is an important base on which to build learning that comes from other cultures.

Where adult learners recognize the impact of past colonial strategies on their ability to learn, it is important that they examine their beliefs about those past strategies and to develop ways of addressing them. Educators have a role to play in this too.

d) Recognizing the impact of colonial strategies on the learners' beliefs about learning

A third emerging theme of the research concerned the unintended consequences that resulted from the use of digital technology for learning in the community. More on unintended consequences is described in sections following, however it is important to highlight the impact of technology on the socio-cultural aspects of culture-based learning in the community specifically its influence on participant's beliefs about past colonial strategies. In spite of digital technology's role in creating "connects", it seemed to create "disconnects" between the people and their culture.

Past colonial strategies such as the residential schools and the use of very dominant religious practices contributed, in part to creating disconnects between Indigenous peoples and

their culture. Because of the impact of domineering religious practices, some participants in the study felt that their culture may have been completely lost or eradicated

Some of the things I'd like to do is, I'd like to get our people more educated on our history ...the true Canadian history, because what we're taught in text books is not nearly as close to what actually happened in Canada. And, you know, we have a lot of issues today ...I feel like we lost our culture. Yes, our people still have their language, but I feel like our community has definitely lost their culture in terms of - How do you say, that religion? So I'd like to educate more on what actually happened and why do we have these issues today? And a big part of why we have these issues today is because people don't know or they don't talk about it (Participant M).

Amongst many attributes that describe Indigenous people, Indigenous identity is defined by "their relationship to the land, common spiritual bond, and language use" (Corntassel, 2003, p. 91). Language can be inseparably linked to religion. Arguably, domineering historical religions may have had some influence on the language and culture. One participant felt that the prevailing religious beliefs in the community a cultural deficit model (Battiste, 2005) such that one culture undermined the other. This participant felt that some of the religious practices she experience were

Very dominant in our community and it is shunned upon by our own people, to practice our own cultures. I know, for example, last year [...] or two years ago, one of our employees brought in a traditional elder from out of town to help facilitate a suicide prevention workshop. And you've probably been to ceremonies or meetings where elders open with smudge ceremonies, right, in a round circle, you know, a sharing circle. One of the community members...saw the smudging happening and the staff member

participated. They went to leadership; the leadership at the time and those elders were kicked out of town and asked not to return (Participant M).

The impact of some of these prevailing religious practices on schooling is beyond the scope of this study. However, it is worth highlighting it as a significant factor in how participants perceived religion's role in shaping their culture and consequently, their education. Even though participants did not feel religion in and of itself was a problem, the undermining of their culture and tradition by some religious practices could not be overlooked, as highlighted by this participant:

I have nothing against the churches, but individuals, they try and force, you know, that religion [and its practice] on their children and then their children kind of rebel against it because maybe they're doing it wrongly. But I know there are a lot of successful Christian people, too, but we need to have a balance where we're not - where we're accepting each other. Do you know what I mean? And I feel like we don't have that acceptance here. You know, like, I have to hide when I do my smudging at home (Participant M).

Religious beliefs were very dominant in the community. In some way, they appeared to have prevented community members from sharing their cultural and traditional practices with other community members and from passing them onwards to younger generations. One participant for instance felt that even though strong religious beliefs had prevented an expression of culture such as participation in *pow wows*, she was able to recognize this challenge and chose rather to advance her culture in opposition to the expectations of community members whom she perceived to be very religious.

I can't let anybody else know I'm doing it. That's the way I feel here, but I've had some of my friends and people know my practices and they've reached out. They're like, 'oh, you

should bring a *pow wow* here. You should, you know, get more of this stuff going. We'd like to get our kids into dancing. We'd like to, you know, learn more and it's something'. It's hard because, like I said, these beliefs are really dominant in the community (Participant M).

One impact of this study related to a heightened sense of identity which participants acquired as they examined aspects of their culture, on their learning, and on their beliefs about past religious influences, i.e. residential schools. This sense of identity is discussed in more details in Chapter 5. It is important, however to highlight that being aware of influences that dominant religion had on the participant's Indigenous culture determined the extent to which participants accepted, for instance, Eurocentric learning. It determined whether or not they would recognize other cultures and to develop personal strategies to cognitively move back and forth between it and the Eurocentric learning culture. As a result participants were willing to challenge past colonial strategies. This leads to the **Determinant: Challenge negative colonial strategies** so that learners are able to advance towards self-identity and self-worth. As a result, educators should be mindful that the introduction of digital technology for learning could create fractures where none previously existed or further increase gaps that may already exist between people and their culture.

This section on the theme of Socio-Cultural Challenges to Digital Technology Implementation and its use in learning has produced some interesting determinants for learning such that they recognize:

1. That digital technology that **enhances culture-based reasoning** could help participants to navigate between Eurocentric and Indigenous worldviews.

2. **Safe digital technology and safe use** of digital technology could help to facilitate learning.
3. Feelings of safety and assurances of confidence will create **a solid safe frame**. A solid safe frame based on such assurances is necessary to enable participants feel safe about their learning and to learn.
4. That **guarantees of privacy** could enhance learners' willingness to use digital technology for learning.
5. That **assurances of equitable perception** that make participants feel that their Indigenous culture is perceptively equal with Eurocentric culture would facilitate learning across worldviews.
6. That recognition of, and **strategies to address trauma** in planning and delivery of educational/technology program, is essential for teaching and learning and for cognition to take place.
7. That a **firm Indigenous cultural learning base** is required on which scaffolding of other cultural forms of learning, including Eurocentric culture can be built.
8. **Challenge negative colonial strategies** so that learners are able to advance towards self-identity and self-worth

While this section has addressed “disconnects” of digital technology, the “connects” are similarly worth discussing. We should be concerned about questions such as what “connects” have technology created in the community? How have these “connects” addressed the “disconnects” highlighted in this section? Do the “connects” even out the “disconnects”?

4.5 Theme 3: Unintended Consequences

In his book, *“Oversold and Underused: Computers in the Classroom”*, Cuban (2003) described the unintended consequences of technology implementation in Silicon Valley’s elementary, high school and post-secondary institutions as outcomes that result from “ignorance, error, vested interest or some mix of these” (2003, p. 132). He argued that the origin of these outcomes often did not matter, but what did matter was the problem that emerged when they produced consequences that were undesirable and how people chose to address those consequences. This raises an important determinant, i.e. the need to highlight awareness of the unintended consequences of digital technology (**Determinant: Awareness concerning technology’s unintended consequence** should be raised. Strategies to enhance positive consequences and to address the negative ones may be required).

Technology, including mobile phones, like a double-edged sword (McGrail, 2006) could produce both positive and negative consequences. Sometimes these consequences produce unintended and somewhat different outcomes than was originally intended. “Disconnects”, as aforementioned are outcomes of the use of digital technology in the study community. While digital technology might have produced “disconnects” between community members/adult learners and their culture, it seemed also to have produced “connects” between them and their culture. These “connects” are discussed in the following section utilizing the “systemic order effects” as an analytic concept (Souter et al., 2010).

a) “Connects”

Souter, Maclean, Akoh, & Creech (2010) describe technological consequences using the systemic effects method. According to them, the systemic effects of technological implementation in any context is likely to produce three “order effects”:

The ‘first order effects’ refers to the immediate and direct effects of a particular factor [...] (in this case of ICTs); ‘second order effects’ [refers] to indirect impacts; and ‘third order effects’ [refers] to societal impacts taking place over a longer period of time (2010, p. 13).

These “systemic order effects” suggests that technology implemented in a context could have far-reaching impacts outside the context. This thought is consistent with McLuhan’s laws of media (McLuhan & McLuhan, 1988). Applying the “systemic order effects” to the recent April 2016 telecommunications upgrade in Bunibonibee Cree Nation produces some interesting ideas. For instance, the first order effect could directly result in the creation of “connects” that could increase community access to information and knowledge. Directly, a significant amount of social interactions based on this increase of information and knowledge could similarly emerge in the community. Where previously, for instance, most community members would call, visit or in the least, convey messages through third parties, with the use of digital technologies they might text, Facebook or tweet directly. This “connect” shaped the community’s ability to create content about their community and its happenings and to share them. One participant mentioned

I’ve noticed a lot more kids with iPhones and Smartphones. I noticed a lot more happening on social media. Some of it is very positive, where we can share what’s going on in the community in regards to events...Like, last night, I saw there was a merchandise bingo happening at the elementary school. I saw that on social media, and then I saw there is basketball happening at the other school. So I hope that’s good (Participant M).

The increasing ability for users of digital technology to constantly move from content consumers to content creators was perhaps one of the significant outcomes of the use of digital technology for learning in the community. For some, it was the speed and efficiency with which they were able to communicate and share information

The motivator for me for using technology is that it is a more efficient, quicker and faster way to get things done. If you want to send a message or get in touch with somebody [...] - I pick up the phone or pick up the iPhone and send a message over and it's done, like - that's a...it speeds up things (Participant X)

This was a direct or first order effect to the community. Participants felt empowered when they created content or when they gathered “followers” on a particular social network (Broersma & Graham, 2016).

For other community members, digital technology helped to establish connections with role models and those that could shape their community’s wellbeing. For this participant, the potential of digital technology to create positive outcomes was important

The importance of following role models on and off the community is necessary to draw connections with the culture...[and] these role models. This is a strong and influential point. And to have that opportunity to begin from a thoughtful stance, to begin from a positive stance, you know, using Twitter you could be following role models or you could be using it to diss [sic] people and cause trouble, right? And that's often what happens. But to begin in some program, you know, a technology communication tool that they're not familiar with and to do it right off the bat from a positive stance, that's strong. And there's hope that as it becomes more regularly available they'll take that skill and follow all kinds of other, I mean, it gives the opportunity for following role models and that's...we know that has such a huge impact (Participant R).

In one of the hands on session, the participants followed the Grand Chief of Manitoba Keewatinowi Okimakanak (MKO), Sheila North-Wilson, on Twitter. They also sent her a tweet, which she acknowledged and to which she subsequently replied. Participants were pleased and

excited that they could connect and communicate directly with her. They were excited about the possibility of directly engaging and sharing community concerns or news in an easy and more efficient way with a policy maker and advocate. The use of digital technology in this form did increase its affordance, especially in the area of its potential influence for establishing connection and for helping to explore its potential for positive outcomes.

A “second order” or the indirect effect of digital technology use in the community produced undesirable outcomes. For instance, some community members had developed new ways of perpetrating old behaviours. Some of these behaviours were positive and others were not. One participant described it in this way

Of course there’s always good with changes, but then we have the bad, where, you know, kids aren’t well supervised on their devices and, you know, this kind of stuff is happening, where these kids ... You know... because bullying is serious and, you know, ...kids are sensitive (Participant M).

Digital technology use in the community had produced negative outcomes and fostered the emergence of a new approach to an old behaviour, bullying, or its online descriptor, cyber bullying.

b) The case against bullying

As community members gained more access to the internet, it seemed that opportunities for cyber bullying also increased. One participant lamented this observation as follows

I see stuff, like kids making up fake accounts of other kids. Like, say, you see an account of your name and this person, ...like, these kids are probably 11-12-year-olds making up fake accounts of each other and telling them to kill themselves, that they’re worthless. You know, there’s so much cyber bullying going on, where one of the kids I know, who is

encountering that kind of bullying shit [sic] actually, she actually attempted to harm herself in school the other day (Participant M).

Incidentally, cyberbullying had persisted for at least a couple of years. It seemed that it became more prevalent as access to digital technologies increased

I think... social network is pretty... A lot of teachers are getting new phones and spending a lot of time with their devices... One of the things that came up two years ago when the cellphones and Facebook came... we had a lot of issues where bullying was happening from the usage of social media... But then I mean... it still is a problem in that within the community, people write things down and it's a lot of stuff in there, taking shots at people. I don't have a Facebook account or anything. I try to stay away from that aspect. I don't want another avenue for parents to get at me [laughs] (Participant X).

Instances of cyber bullying were observed in the schools, especially the elementary and high schools:

In the school, within the school... a lot of negative stuff in there. So we, the School Board at that time tried to ban or prevent the usage of cellphones or iPods and those kinds of things in the schools... There was too much misuse of technology and that was when we had a difficult time... We still have that ban but nobody's really [respecting it] (Participant X).

Community leaders agreed that there should be some form of support to help young members to address cyber bullying. When they approached a community member who could significantly influence this practice, he said

I don't actually have those accounts... available to me... People come forward to me and show me what's going on. I don't have those specific accounts available to my eyes, (Participant M).

It seemed that he might have been able to address those instances of cyber bullying; but was unable to do so because the resources and knowledge were not available to him.

In summary, digital technology had also created “connects” between the research participants and their culture. It had facilitated connections to role models and those who were able to influence policies on social and economic issues and to explore options that responded to the ills of unintended outcomes such as cyberbullying. These were negative unintended consequences that the use of digital technology had created. Some of the positive unintended consequences concern its affordance or its inherent ability to be used to do meaningful work.

In this section related to the unintended consequence of using digital technology for learning, the following determinant emerged:

1. **Awareness concerning digital technology's unintended consequence** should be highlighted prior to and during its use for learning. Strategies to enhance positive consequences and to address the negative ones may be required.

4.6 Theme 4: Affordances

The fourth theme that emerged from the study related to the affordance of digital technology. The affordance of an object is its perceptive properties and its link to potential action (Gaver, 1991). Affordance is often described as the “possibilities for goal-oriented action afforded to specified user groups by technical objects” (Wagner, Vollmar, & Wagner, 2014, p. 33). As a perceptive property, “living creatures [may] share the same environment [or tool] but perceive it

differently in accordance to their ‘affordances’” (Calo, 2017, p. 74). A simplified definition of affordances is “action potential of a tool to achieve a [specific] objective” (Akoh, 2012b, p. 59).

The affordances of digital technology in the research context included its potential:

- a) To help participants remember aspects of their culture.
- b) To entertain and to create entertainment.
- c) To enhance a sense of safety in those who have and use them.
- d) To enable the doing of new things
- e) To enable connection with the past for the purposes of enhancing the present and the future.

These affordances emerged when participants were asked to critically reflect on the impact that digital technology had on their community. To produce these outcomes, participants were asked the following interview sub-question, “what were the most important outcomes that emerged from using a particular tool in your context?” Participants produced reflection that suggested that the use of digital technology for learning seemed to empower them, helped them to become more critical of their learning, and helped them to reveal cultural aspects that they might have been unaware of. These outcomes are described in this section.

a) Technology Affordance: The affordance to remember culture, to keep records, to archive and to repurpose Indigenous practices can be leveraged through focused strategies

(Determinant: Digital technology can be linked to culture to enhance student learning).

Earlier, the first and second order systemic effects of digital technology were discussed. The first order (direct) effect produced community members who seemed to transition from content consumers to content creators. Participants created digital artifacts that they used to connect with community leaders and role models.

The second order (indirect) effect produced cyberbullying as an unintended consequence. This outcome is undesirable and strategies for mitigating its impact should be developed.

The third order (societal) effect concerned digital technology's impact on the socio-cultural aspects of the community. These socio-cultural aspects include how digital technology influenced the way community members communicate and interact between themselves; and how it was used to preserve cultural knowledge. One participant described the impact of digital technology to preserve knowledge as follows:

And I found out in the past year that technology has hit our communities really hard especially [with] the recent acquisition of [the] 3G network. Now I see young people...that make videos of acting out their different activities, plays and all that...For instance, here we had a wake of an elder, we lost an elder and one of my grand children [was] in a wake. I lost my mother... and my granddaughter borrowed my phone and I got the phone to look at the pictures and she actually took a video of the wake service, part of which we were singing [in] Cree. I was here; I didn't know she recorded it. At a young age, they are able to do that. Technology has really bombarded us with...eh... its not chaos but its an exciting time in our lives where there is room to go out into the world [outside] the community...we are able to communicate with anyone in the world instantly (Participant N)

Mobile devices were used for record keeping, for creating and archiving cultural contents in the community. Participants felt it helped them to preserve their language, similar to its use for language teaching and instruction (Mignone, Henley, Brown, O'Neil, & Ross, 2008).

This affordance to carry out a particular task in relation to an individual's frame of reference (Greeno, 1994) seemed to produce an opportunity for connections to be established

between community members and their culture. One instance of this opportunity concerns the relationship to the land and to past traditional practices such as trapping

We know, we [have] seen [...] our elders, how they lived before. They even had log cabins, lived their nomadic lifestyles when they traveled to the trap lines. And the thing is eh... that lifestyle was not too long ago. Our people are still...are bound with the life out there in the traplines...I still see places where my dad took me and showed me where my grand parents use to come, where we, ...and we need to take our youth and our community members back to awareness of ah...what the land gave to us. How we got our living from the land. And with the activity, what we are doing with our students, if we can at least get some of the history with our elders and even the spoken, the verbal thoughts [recorded]...We got recording and saved them, that part of history will be saved and not lost. Our children's children, grand children, great grand children... Hey, it was my grand mother who said this 20, 30 years ago. Technology is, there is hardly any boundaries now (Participant N).

Participants appeared to think that technology helped them to preserve cultural aspects. The preservation of Indigenous culture seemed to be a significant portion of Indigenous identity (Deer, 2011; Ladislaus & Stambach, 1997). Digital technology provided the affordance for capturing and preserving historical knowledge in order that it can be shared with present and future generations.

Another participant described the affordance of digital technology as a tool for the repurposing orality

[Digital] technology could help to repurpose orality, and also to reemphasize the importance of listening, speaking, viewing and representing. When you look at the law,

oral testimony was paramount and it took quite some time before written testimony was accepted in law. So, it's historically there for all of us. So... and with the amazing things that technology... where you can have those visuals ...where you can link to things ...where and it can be done so easily. I just see it as a huge tool for the students to gain some capacity and to take into the classrooms to bring life to their learning. So, you can go out on the land and, or even out in the schoolyard or go for a walk and you take those pictures and these kids love doing it (Participant R).

The affordance of repurposing orality seemed to be appropriate in a context in which knowledge is largely passed orally from one generation to another. One of the research participants who had created a digital artifact of an elder in the nursing home seemed to prefer audiovisual methods of capturing knowledge to written methods. She intended to use portions of her artifact to teach Cree language lessons in her classroom.

As participants created and preserved historical digital artifacts, they also planned, that in the future they would use them to recall memories of the past. It seemed that they recognized digital technology's affordance for "recording now and recalling later". McLuhan describes it as technology's ability to retrieve (McLuhan & McLuhan, 1988). Participants who recognized this affordance felt empowered and appeared to have a renewed sense of identity. One participant described this affordance for recalling individual identity as follows:

Having that tool be something that helps them [community members] bring them [i.e. culture] back and discover who they are and take that who they are into the present and the future...I think it could be an amazing tool (Participant R).

The affordance of digital technology for remembering culture, managing, saving, and retrieving old records and memories is useful for learning. This leads to the determinant that it is

important that educators and researchers recognize the potential impact and effect of digital technology to transform culture (**Determinant: Recognize digital technology's socio-cultural effects and its potential impacts, such as its ability to transform individual practice, culture**).

The knowledge gained from “looking back” can be applied to practices of today and the future. Participants were able to connect with their culture and to explore the long-term potential impacts it had on their identity.

b) The affordance to learn, entertain and “feel-good”: Participants wanted to feel good about their learning.

Another area of digital technology affordance concerned its role in creating entertainment or its ability to be used as a tool for entertainment. Participants felt that socializing while using technology helped them to feel good about themselves despite the economic odds and socio-cultural challenges they faced in the community.

An elder highlighted the role that movies played from mobile vehicles had had an impact on their childhood. He said, “comparatively, digital technology can increase video usage for learning, similar to the use of mobile movies (on trucks) for learning and entertainment in the past” (Participant N).

He described going to the park to watch these movies with excitement. He then parallels the excitement of watching a movie from a truck to that of watching a movie on a mobile device. Mobile devices could be used to create videos and to watch movies. They could provide entertainment value that could be valuable in a learning context. Learners seem to want to use digital technology for learning if it provided entertainment value to them, thus leading to the determinant that identifying the entertainment value of digital technology, and pedagogically applying this knowledge to the learners' context could result in increased use by learners.

(Determinant: Explore the affordance of digital technology of providing entertainment value and then harness it for learning). Participants seemed to recognize the affordance of digital technology for creating entertainment; that even though the medium of delivery had changed from mobile vans of old to mobile devices in their hands, the entertainment value of digital technology has a potential to be used for learning and that potential has remained the same.

During one of the research activities participants created personalized videos and “selfies” (self-taken images) and uploaded them to their blogs and microblog sites such as Twitter. They immediately followed this action by posting comments about each other’s photos. Participants who used their mobile devices to create selfies seemed to show a sense of pride and self-identity when they did so. It seemed that this activity made them self-aware and it seemed that it produced a sense of “good feeling” in them. Participants felt that they could transfer this feeling to learning. Participants felt proud of their cultural practices by sharing self-taken images with others.

Yeah, the trap lines, definitely. I’ve seen a lot of my friends posting selfies of them [and] of their hunting place. They call it blinds [tents used while hunting]. So they’re there taking selfies out there with their hunting ...blinds. They’re, like, little shelters where they hide behind when they’re waiting for ducks and geese (Participant M).

They also shared their good feelings on social media sites. They seemed to derive entertainment value from viewing other community member’s multimedia digital artifacts. Participants were able to experience the affordance of digital technology for engagement, sharing, connecting and possibly learning.

c) The affordance of physical safety and of safe communication: Digital technology seemed to provide an affordance of safe communication.

For most participants, the use of digital technology seemed to provide a sense of proximity to family, friends, colleagues and relatives. This sense of proximity seemed to increase confidence and feelings of safety. Digital technology also seemed to create confidence in the participants to communicate about community related issues without feelings of intimidation. (**Determinant: Digital technology could create confidence** to communicate about issues). One participant described it as follows

Yeah. But it [mobile] is handy, I think, for hunters, too. You know, if something happens out on the lake or the bush, where their machine breaks down or they can't get back, they can easily call (Participant M).

Participants felt that having digital technology in close proximity such as a mobile device in their hands allowed them the relative sense of security to venture away from the community, because they could call whenever they felt unsafe or in danger.

Beyond physical safety, participants felt that the availability of digital technology enabled them to feel safe to speak freely about issues that concerned them. Prior to the use of digital technology, they felt stifled and somewhat suppressed about expressing how they felt about community issues

That lesson plan I was developing, actually, I have that on PowerPoint presentation with a couple of videos, and I was thinking about [uploading] it, making it available online, but again, you know, that suppressed feeling I have. You know, I have a lot of bad reviews and ... I don't know, just, in a way... I feel like I have to be careful of what I say and do (Participant M).

Participants did not want to feel judged or intimidated when expressing themselves about community related issues with other members of the community, particularly elders. Rather, they

wanted to feel safe about communicating to them whether they lived in the community or outside the community. Participants who were teachers also did not want to feel judged about the use of digital technology in the classrooms. They wanted to feel free and safe about discussing pedagogical uses of digital technology with others.

In one of the study activities in which participants had to establish community connection, they chose to follow an elder or leader using Twitter. They expressed excitement about communicating directly with the chief. They felt safe about sharing information with someone with whom they were familiar. They seemed willing to engage and discuss community development issues with that person. I reflected about this during a discussing with a participant

You don't want to count on those [negative] narratives and you have to be able to speak up about yourself, nobody else can do that for you. And the fact that you can use technology to connect with someone important directly is very valuable. So for instance, yesterday we got to follow certain key...people [on social media] from the province that have a voice out in the community and to say, 'I am connected with you and I can see what you're doing right now and I appreciate it. And I want to be able to put my voice out in that space as well', I think it's very important. So [...] I hope [you are] beginning to see that sort of participatory policy [making] ...that could be possible through [mobile] technology, because it's so [devolved] physically from the mainstream that there's probably very little chance of engaging with this person. And maybe that's the undoing for you, particularly because [mainstream media is so molded to be isolated [that you] choose not to communicate with [other members of] mainstream society using it. But [mobile] technology does give [you] that advantage to speak to people directly (personal reflection)

Another participants agreed

Sometimes, and I've seen it happen, when you start that communication through technology – this was a few years back in Nisichawayasihk and students were doing a part of their learning for their course by doing something in their community – they took the *Manitoba Reads* and started up a club about it. As part of their activities they chose to connect via technology with the author [... using] different tweets [...]. But out of all the communications, the author was really touched by what they were doing and made personal connection. I'm not sure if she eventually came there or whether it was a videoconference...[but] they connected with that author (Participant R).

Within the confines of a safe frame, participants were able to communicate freely and safely because they felt respected. They were likely to communicate more where they would not be undermined and where they could engage with those with whom they would otherwise not have had an opportunity, such as an elder or a community leader. The use of digital technology provided an opportunity to discuss culture or community related matters with someone influential. Access to digital technology seemed to grant an affordance for participants to “connect” with culture and to be bold about communicating community matters with themselves and with leaders or policy makers.

d) The affordance to do “new things” that were previously impossible

Participants felt that digital technology had provided an affordance that brought new ways of doing things, such as the ability to remotely pay for goods and services that were unavailable in the community. This seemed to provide a determinant to explore new methods of doing things **(Determinant: digital technology could enable the exploration of new methods of doing things.** This determinant for exploring new options allowed participants to conduct research and to

be more inquisitive about learning). A participant described the ability to pay bills and the cost of goods and services on their mobile devices as follows

Yes, that's good. And that's another thing that's pretty good with technology...[that] is billing. You can make your payments online and it's so efficient and you don't have to be falling behind with your payments because sometimes you have to mail your payments and your payment doesn't get there on time and you get into trouble with that, with the late payment (Participant X).

It seemed that this participant wanted to avoid the trouble associated with late payments. For a remote community that did not have banking facilities, paying for services online might seem luxurious.

Participants wanted to feel as confident in the use of digital technology in their classrooms as they did for paying for goods. Those who were teachers in the community elementary school spoke about the exciting new possibilities and the opportunities that digital technology offered for teaching. From the study's activities, these participants felt that they could teach their students how to use digital technology to access new content, to archive content, and to repurpose content for later reuse in the classroom. One participant who learned how to download YouTube videos onto a memory device said she was excited

...Especially with the YouTube videos. I've been wanting to learn how to download a YouTube video to a memory stick or to a DVD and...show the students...certain courses, yeah. So I've been downloading like crazy [since] last night (Participant A).

Participants were willing to incorporate new possibilities into their learning frameworks. They wanted to further explore the utility of mobile devices for field learning. They were willing to introduce activities such as photo voice and then use the digital artifacts that they create to

make up photo stories about perceptions of their community. One participant wanted to explore the possibility of “having a field trip or something like a nature walk and hav[ing] them [her students] take pictures of what they see” (Participant A). Another participant highlighted the importance of digital technology’s affordance of connecting with their students by recording “an elder telling stories and then just playing it in the classroom“ (Participant L).

Over all, participants felt that digital technology provided an affordance that allowed them to bring the community into the classroom and to take the classroom into the community. One participant described this affordance in relation to the ability of learners to conduct research about their community. For a community without a library, having digital technology that provides access to knowledge seemed to momentarily replace the need for a library

Well, we don’t have a community library, so the technology is there in terms of research.

The kids can just go on Wikipedia or Google. And so, research would be good, is a good advantage because we don’t have the library (Participant N).

The use of digital technology for learning in the community provided an affordance for research. Digital technology also afforded an opportunity for participants to connect with their community and for it to be used as a tool for narrowing the gap between them, their community, the elders in the community and the classroom.

As aforementioned, affordance enables connection with culture. One important aspect of this connection related to digital technology’s affordance to view the past, establish links with the present, and to explore future potential learning abilities.

e) Affordance: beyond community connectivity – Historic, present, physical or cognitive: this ability to connect the past with the present and future helps participants to remain connected to their culture.

Digital technology seemed to provide an affordance to establish relationships not only with members of the immediate community but also with Indigenous people in other communities

Now we have a better communication. And that was just a month ago [referring to the mobile telecommunication upgrade]. It is just incredible. I am able to see cultural events in other communities in Canada and other provinces. There are other activities in the communities, dances and ceremonies. So awareness, even in this day and age, [is] almost instantaneous (Participant N).

Participants felt that this connection was important for establishing relationship with the broader Indigenous communities. Perhaps the usefulness of digital technology lay in its affordance to “freeze” history and to allow for an individual analysis of a snapshot of that moment. Through access to historical content, participants were able to examine pictures and videos that they found online and to use them to question history, such as wanting to know what their community might have looked like at that time. This leads to the determinant of digital technology to preserve history (**Determinant: Digital technology preserves history**. Indigenous learners might be able to explore this affordance to connect learning culture and other social aspects). They were able to examine what patterns of communication existed at historic times and to examine how environmental, social and economic factors affected them and their culture then and now. One participant described this affordance as follows:

One of our community members who has done lots of research and [who was] reading old history books and all our transcripts and journals from early days where Northwest Company and Hudson Bay were in the land... said there was a communication, and a formal communication where a Cree all the way from northern BC to Quebec northern province were able to communicate regularly and ever so often. Every five to 10 years

they would have big grand council meeting of the Cree people and they will [make decisions] there. And also every activity like [discussing the] differences between people and [whether] there is a need to do some...ah problem solving. And even small battles and all that. [Back then] runners [...were] able to [...come] here from all the way from northern BC within a short matter of time. [Those] days it was still [distant], and now we do it with a click of [a] button. But imagine if they had it [digital technology] back then, 400 or 500 years ago (Participant N).

The affordance of “freezing” the past and then analyzing it seemed to increase participants’ interests for creating new digital artifacts. They hoped that their artifacts could be used in the future to tell their present story. This idea of a potential future value of digital artifacts brought to the present seemed to incentivize participants to create digital artifacts such as voice and video notes that arguably, marked their place in the “sands of time”. Some of these voice notes and videos were captured from interviews and photo voice activities in their communities. Subsequently, through the analysis of these artifacts they were able to draw connection between themselves, their family and community members. As they culturally reflected on the genealogical connections of their immediate family members, they created new digital artifacts of ancestral maps of family and community connections. They then told stories of these connections. They hoped that future generations might be able to do the same when they retrieve the digital artifacts that they had created.

From this activity, participant felt that digital technology’s affordance for preserving history had helped them to narrow the gap between them and their idealized culture. It had also seemed to help in narrowing the gaps in relationships between them and other Indigenous communities.

The affordance for creating connections was highlighted by a participant during the activity for creating a family genealogy

The family tree yes, because I... usually just...write it out, right? ...And I kind of knew that ...there's an app for that, right. Yeah, because I kind of knew that... that kind of stuff was out there, I just didn't bother, like, really searching it up. [...] I didn't really know how to work it, but now that I [have] actually seen how it's done on the computer I can actually do it myself, and it's actually pretty straightforward to do (Participant D).

Participants also felt that it afforded them an opportunity to tell stories. Even though story telling is an inherent part of the participants' culture and many had the ability to tell stories, they were unprepared to fully leverage digital technology's affordance for transforming storytelling into "storywork" (Atleo, 2009). Storywork is applying the "principles of respect, responsibility, reciprocity, reverence, wholism, inter-relatedness, and synergy related to using stories and storytelling for educational purposes" (Archibald, 1997, p. iii). Storywork enabled Indigenous learning, especially learning that entailed the intergenerational transmission of values and knowledge from one person to another.

The fact that digital technology enabled them to "freeze-frame" a portion of history for analysis and to contribute in part to telling their own story highlighted visible gaps in their knowledge of digital technology. It also highlighted its affordance to bridge this gap by providing an affordance to transform stories into "storywork". A participant described the frustration related to her inability to undertake storywork as follows

And I feel that it's because the stories that [we know] were shared to our generation and us. His name [...] was John Chubb. He was our cultural teacher. And you know he taught us these values. And the stories. And to respect people. I couldn't ask what's missing in the

community. We do have cultural teachers. You know I'm not trying to talk bad about anyone. But I feel the stories are missing. You know they are and those are important to carry on generation to generation (Participant O).

In some way, participants recognized the affordance of digital technology to do more than the simple functions of capturing images and videos and producing digital artifacts. They were able to perceive that digital technology offered the greater affordance of storywork. Digital technology, especially if used for storywork, can capture learner's attention

I could use it as a tool; especially like we don't have internet for...everyone...We don't have Wi-Fi at the school. But what I learned is you can download and use the projector and things like that. That's really helpful. And then, that student...you get their attention when you use those things, you know. Yeah, because [I] saw that one time in Grade 1. I was walking by and the kids were just looking at the wall... and they were well behaved and [the] teacher was talking and they were just looking and [paying attention] (Participant E).

Digital technology provided the affordance to establish connection with the broader Indigenous community. It allowed participants to freeze a portion of history for analysis, to capture the present for future analysis and to transform story into storywork.

In this section, digital technology produced some affordances. Digital technology could:

1. Be used as a tool to **link to culture** in order to enhance student learning.
2. **Transform culture and practice.** Educators should consider this potential in their design and use of digital technology for learning.
3. **Provide entertainment value** allowing educators to explore and harness this affordance and to use it to engage learners.

4. **Create confidence** in those who use it and it could enable them to communicate with confidence about their issues.
5. **Enable the exploration of new methods** of doing things allowing participants to conduct research and to be more inquisitive about learning.
6. **Preserve history**. This affordance might incentivize learners to move beyond consumers of content to creators of content. They might continue to do so in the hopes that their story could be preserved to create lessons for future generations.

4.7 Chapter Summary

Four major thematic outcomes emerged from the study. These themes were in response to the research question, “what are the determinants that assist a sample of post-secondary Indigenous learners in an isolated fly-in only community in Manitoba to adapt and orient between Eurocentric and Indigenous cultural ways of learning?” The study utilized digital technology as a tool for producing documentation. By exploring these determinants, educators might be able to develop understanding of learning gains among Indigenous learners.

The first two thematic outcomes were concerned with the “disconnects” that occurred in the community. These included:

1. The technical, community, and cultural disconnects resulting from the application of digital technology for learning.
2. The socio-cultural challenges of digital technology implementation.

The last two thematic outcomes were concerned with the “connects” that occurred, namely:

3. The unintended consequences, which produced positive and/or negative impacts on the community.

4. The affordances of digital technology for creating connections between the past, present and future, for fostering learning and for creating a sense of identity.

The technical, community and cultural disconnects resulting from either the positive and/or negative impacts of technology in the community determined how community members related with themselves. This disconnect determined how the research participants leveraged digital technology for their learning. Specifically, the absence of a robust internet infrastructure created a technological “disconnect” that prevented the introduction of value added services, such as tele-health or more advanced forms of learning with digital technology. There had been past and renewed promises to build a northern wide fiber-optic infrastructure that would carry the traffic between northern Indigenous communities and from these communities to the south and then on to the global network (Jillian Taylor, 2016). Such infrastructure would be able to address some of the present challenges of learning with digital technologies.

Connecting the local with the global is an important determinant for economic development (Mata & Pont, 2016). The availability of a community-wide fiber infrastructure is an essential determinant for learners to access and create Indigenous content, to transform from knowledge consumers to knowledge creators, and to enable cognitive movements from one worldview to another to occur. However, the presence of a network alone is insufficient to deliver these sorts of value. More would have to be done to leverage the existence of digital technology for instance, for economic, social and cultural gains.

The presence of a collaborative platform that could leverage inherent Indigenous traditions of collaboration and dialogue for solving problems and for developing the community could be extended to include all stakeholders that should have interest in these goals. Having the local government administration, provincial and federal government departments and the communities

themselves become involved in dialogue for strengthening community development could be a significant determinant for sustainable service delivery in Indigenous communities. Value added services like tele-health and education could benefit from such platforms. If they exist, they should be strengthened so that better dialogue, collaboration, cooperation continues. If none exist, one should be created.

With respect to the value of such a platform for Indigenous education, community members like parents should be invited to participate in the learning of their children. Specifically, they should be involved in Indigenous learning methods as a base on which other methods of learning including Eurocentric forms could be scaffolded.

The second thematic outcome focused on the socio-cultural and economic challenges of digital technology implementation and its use for learning within the community. This outcome related to the confidence that community members had on digital technology's affordance. It also related to its affordance for fostering cognitive movements between worldviews.

Participants, who through Indigenous culture-based reasoning were able to describe their skepticism of digital technology, were also able to reflect on digital technology's positive impact on their learning. They were able to decide whether or not it had an affordance to facilitate cognitive movement from one cultural space to another. To necessitate its use, the presence of a safe frame was significant. This frame ensured that some level of privacy of individual data and equity between cultures at play in the context and between actors involved in their learning was present.

Another important sociocultural challenge to learning concerned the presence of historical trauma in the community. Trauma seemed to affect learning. As a result, those who wanted to explore movements between cultures would have used the digital technology that was developed

in one culture to produce harm in another culture. This kind of digital technology use produced trauma instead of positive affordances. It further hampered movements especially when learners' feelings and emotions were not considered during the use of digital technology. Community members suffered various forms of traumatic experiences. In spite of these, they showed courage, resilience and they exhibited willingness to continue to learn. Even though trauma had resulted in the frequent deaths of community members, some by suicide, current traumatic circumstances reminded participants of the impact of past practices such as the residential school system, the role of such schools, and the lasting impressions they had made on the participants, their parents and grand parents.

Those who design and facilitate learning in Indigenous communities should build this consideration into pedagogical strategies so that their learning methods holistically involve a recognition of the learners' history and include consideration for their Indigenous culture as the base on which learning can be scaffolded and on which educational strategies can be developed. From this foundational base links to Eurocentric learning methods can be established.

The third outcome was concerned with the unintended consequences of educational technologies in the community. Individual and community related "connects" were established between digital technology and community members. Most of these connects were predicated on the recent upgrade of the local mobile infrastructure. Despite this upgrade, there remains a significant digital divide in the community and between the community and other communities. Some unintended outcomes resulted from the use of digital technology. They seemed to enhance an existing undesirable bullying behaviour, extending it to the online space. Cyberbullying was a negative consequence of digital technologies. Even though it might be difficult to determine potential negative consequences of digital technology implementation, using tools such as

McLuhan's Tetrad or the "systemic order effects" (Souter et al., 2010) could enable educators to elicit some unintended negative consequences. It could help them to devise means of preventing or mitigating their impacts. Cyberbullying should not be tolerated in the community.

As a double-edged sword, digital technology produced affordances that were somewhat positive and that could have positive impacts on learning in the study community. Besides producing more community-based training and awareness programs that leverage digital technology, pedagogical strategies that highlight these positive affordances could help shift young people's focus from the simpler social benefits derived for personal gain to the technology's potential for educational values. For instance, it could help learners to transition from story telling to storywork, i.e. becoming aware of themselves in their stories. Learners could explore digital technology's affordance to remember culture, to keep and maintain records and archives of community cultures and practices. This affordance of digital technology for retention could be useful for knowledge production and it could help community members to shift from consumers to producers of content. The inherent ability of technology to create unsafe environments was contrasted with its ability as a tool for safety; one that could help community members communicate and interact safely and to safely share information, within the context of a safe frame. Its application here was done in a way that recognized, enhanced and did not undermine cultural practices for communication and interaction.

Digital technology was used as a tool to learn, entertain, and to "feel good" about learning. Within the confines of a safe frame, participants who felt good about their learning were more likely to engage, share and connect with others, and consequently to learn. Within this context, they were also able to create "new things", to innovate and to undertake learning that were previously not possible. For instance, participants recognized that they could use digital

technology to connect the past with the present and future such that it helped them to become more grounded in their culture. It allowed them to explore the uses of digital technology for future community development.

By further exploring these four themes of the study presented in this chapter, some determinants emerged that may be necessary for learning with digital technology in the Indigenous community of the study. This is even more relevant because the study context required learners to cognitively move between Eurocentric and Indigenous ways of learning. For movements to take place, Table 8 presents these determinants categorized thematically. This table of determinants is further discussed in chapter 5. It is presented in this study as a useful guide of factors that educators and learners should consider with the use of digital technology for learning in contexts where multiple cultural learning methods are present.

Table 8: Determinants of learning in Indigenous communities

Cultural and Pedagogical Connects and Disconnects	Socio-Cultural Challenges
<ul style="list-style-type: none"> • Suitable and appropriate digital technology could help to narrow the medical services gap. • Individuals with technical knowledge could be helpful in articulating the technical needs of the community and in fostering good collaborative platforms). • A non-hierarchical platform for dialogue is useful for sharing knowledge and for collaboration. Education could significantly benefit from this platform. • Culturally appropriated technology that connects learning to Indigenous culture and Indigenous culture to learning is appropriate technology. 	<ul style="list-style-type: none"> • That digital technology that enhances culture-based reasoning could help participants to navigate between Eurocentric and Indigenous worldviews. • Safe digital technology and safe use of digital technology could help to facilitate learning. • Feelings of safety and assurances of confidence will create a solid safe frame. A solid safe frame based on such assurances is necessary to enable participants feel safe about their learning and to learn. • That guarantees of privacy could enhance learners' willingness to use digital technology for learning. • That assurances of equitable perception that make participants feel that their Indigenous culture is perceptively equal with Eurocentric culture would facilitate learning across worldviews. • That recognition of, and strategies to address trauma in planning and delivery of educational/technology program, is essential for teaching and learning and for cognition to take place. • That a firm Indigenous cultural learning base is required on which scaffolding of other cultural forms of learning, including Eurocentric culture can be built. • Challenge negative colonial strategies so that learners are able to advance towards self-identity and self-worth
<p style="text-align: center;">Unintended Consequences</p>	<p style="text-align: center;">Affordances</p>
<ul style="list-style-type: none"> • Awareness concerning digital technology's unintended consequence should be highlighted prior to and during its use for learning. Strategies to enhance positive consequences and to address the negative ones may be required 	<ul style="list-style-type: none"> • Be used as a tool to link to culture in order to enhance student learning. • Transform culture and practice. Educators should consider this potential in their design and use of digital technology for learning. • Provide entertainment value allowing educators to explore and harness this affordance for learning. • Create confidence in those who use it, and could enable them to communicate with confidence about their issues. • Capable of Exploring New Affordances of doing things allowing participants to conduct research and to be more inquisitive about learning. • Preserves history, create history. This affordance might incentivize learners to move beyond consumers of content to creators of content. They might continue to do so in the hopes that their story could be preserved to create lessons for future generations.

CHAPTER 5: CONCLUSIONS AND RECOMMENDATION

Observations during the study indicated that participants experienced a renewed sense of identity, sense of self worth and a willingness to learn when digital technology was used in an Indigenous culture-centric manner. Participants were able to transition their learning from the community into the classroom. Those who were teachers thought about taking the opportunities that the affordances of digital technology presented in the field into the classroom. These observations indicate that cognitive adaptations and orientations had occurred between participants' Indigenous context and the Eurocentric context of their learning environment. Atleo (2001) described these adaptations and orientations as shifts from a "source" to a "target" domain, and back. In the current study, cognitive movement resulted when participants demonstrated elements of personal growth in their learning. Movements were observed when these growth elements seemed to improve their learning as they moved between their own Indigenous "source" domain and the Eurocentric "target" domain.

The result of this study is presented in this chapter. The first section describes the notion of adaptation and orientation within the research context. The section following highlights the technological challenges in Bunibonibee Cree Nation. Techno-Culture Adaptive Framework that resulted from analyzing the data is also presented. Four thematic areas emerged from this analysis that are captured in this framework. Various groups of determinants are presented within each theme. The final section highlights the impacts of the study on the study community. The chapter concludes by raising further research questions and offering some concluding thoughts.

5.1 Cognitive Movements for Adaptation and Orientation

Cognitive movements seemed to be associated with a sense of self-awareness. As participants felt more self-aware, they took control of their ability to move from one cultural

learning domain to another. For instance, participants who were teachers learned to take control of their learning and to apply the lessons learned from this study to their career as teachers in the community elementary and high schools in which they were employed. They recognized the necessity of including Indigenous culture-centric information in their lesson plan and content. They also aligned community-based activities with classroom-based ones making sure to include the right quantity and quality of content to balance learning between Indigenous and Eurocentric learning methods. They were more involved in creating lesson outcomes and they identified the implications of these changes to their personal and institutional growth.

This renewed sense of self, resulting from self-awareness, enabled participants to become more aware of their potential to move from one world domain to another. They were able to decide whether or not a purported movement could produce benefits to them and to decide whether or not they should even make that movement. Simply, participants took control of constructing the necessary bridges between the different domains or worldviews at play and to cross these bridges whenever they chose to (Aikenhead, 1997).

The fact that participants could perceive the affordance of digital technology for adaptation and orientation between domains was significant. Digital technology had been used in the past in the community in a manner that produced unintended outcomes such as cyberbullying. Participants recognized this potential for negative unintended consequences and they were able to explore other affordances and consequences beyond the negative. For instance, they explored the utility of digital technology to make them feel good about their learning through applying its affordance for entertainment. They were willing to explore the ability of digital technology to produce positive affordances. These remarkable shifts from negative unintended consequences to

positive affordances had a positive impact for adults learning with technology in this community, and it could hold similar utility for others in a similar context.

The area of cognition and learning is well researched in the literature. Lots of metaphors have been used to describe cognition, learning and movement. Alongside Aikenhead's (1997) description of a need for cognitive bridges, Brydon (2012) described cognitive mobility in the service of cognitive justice within the domain of transnational literacies. Parush & Berman (2004) described the measurement of cognitive movement by using landmarks, while Livingston (2013) suggested that distractions could contribute to cognitive loads or overloads in technology use, where for instance, information shared in 2D would increase concentration compared to the distractions offered by 3D tools for learning. Kulig et al. (2010) spoke of cognitive dissonance and Rowe (2012) spoke of a “zone of Proximal development” and scaffolded movement through a concept called cognitive apprenticeship (Fee & Belland, 2012). Cognitive apprenticeship is a concept of mentorship in which the learner learns until s/he can stand on his/her own. Fee & Belland (2012) described cognitive structuring as models for organizing information and predicting phenomena. Rowe's (2012) description of cognitive presence referred to an individual's “ability to make meaning through sustained communication”. Other scholars like Jaffer (2010) described cognitive psychology and Stairs (1994) contrasts between instructivism v. constructivism within this domain of cognitive psychology.

Atleo's description of cognitive styles and orientation (2001) using metaphor as an idealized cognitive model (ICM) provides contextual relevance to the term “cognitive movement” used in this study.

It seemed that for cognitive movement to occur with the use of digital technology in an Indigenous context commensurate pedagogical change also needed to occur. Such change might

have an impact on pedagogical planning, design and delivery of learning. This study argues for the recognition of Indigenous culture and a serious consideration of the Indigenous context where the learning is expected to take place during pedagogical planning, design and delivery.

One specific approach to appropriating pedagogical strategies is to recognize that the Indigenous domain of the learner is the base “source” domain upon which other cultural learning context can be built. Indigenous learners in this community are likely to be comfortable and familiar with their source domain. Over time, as they grow from childhood to adulthood (Michell et al., 2008), they no longer need cues to understand concepts in their Indigenous cultural domain (Hollingworth, 1932). If participants are likely to explore the “unfamiliarity” of other domains by taking on additional learning cues from the “familiarity” of their own learning domain, then learning should first commence from this domain with which they are familiar. This order of contextual recognition first, and then scaffolding next, is important in a context where learners are expected to succeed in multiple domains.

Some Canadian initiatives seemed to appreciate this notion of scaffolding from the “familiar” to the “unfamiliar” cultural space. The *Indigenous Course Requirements* of the University of Winnipeg is an example of a foundational course in post-secondary institutions offered to all students of the university to prepare them for learning from an Indigenous foundational base (UWinnipeg, 2017). Although this approach seems to generalize the learner’s culture base as non-Indigenous, it is a step in the right direction.

In an increasingly globalized world with growing migratory patterns, this notion of learning from a familiar cultural base could inform how students from others cultures could be better prepared for study in Canadian post-secondary schools. These types of learners could find utility in this “bottom-up” approach that recognizes their culture first; and then from this familiar

base, allow them to construct bridges and scaffolds to their target learning culture i.e. Canadian post-secondary. In simple terms, it may be easier to learn from a familiar base and then transition to the unfamiliar, than the other way round.

Recognizing the learner's specific Indigenous context might lead to a better understanding of their capacities and the gaps needed to succeed in their target domain. This notion may be consistent with concepts such as learner-centered learning (Jaffer, 2010) or the flipped classrooms (Billings, 2016; Bristol, 2014) in which learning is personalized and control is put in the hands of the learner. Here, learning is considered from the learner's perspective as a means of recognizing the learner's personal context and using it as a base on which other concepts could be scaffolded. Considerations for a cultural learning base and the requirements for personalized learning could be the difference between succeeding and failing a course or program in Canadian post-secondary schools especially for Indigenous and possibly, international students.

Later in this chapter, failure is described as a perceived concept that could be alien to Indigenous learners. As an alien concept Indigenous adult learners may be unable to relate to the significance of failure (i.e. the inability to understand learning cues) in its Eurocentric definition. This lack of inherent Indigenous cultural knowledge of failure may prevent the learner from avoiding it. Indigenous students who do not understand this concept might experience it as a lingering but burdensome thought throughout their learning pursuits; resulting in actual failure.

The notion that learning could take place with many possibilities for "multiple trials" may be a better approach to learning. This notion may be consistent with Indigenous forms of learning where the learner is expected to try and try again until they succeed. It should be a factor in determining the Indigenous cultural base on which further learning could be built. More research is required in this area.

Another challenge faced by the study participants concerned the intersection of their Indigenous ways of learning with Eurocentric ways of learning. Participants felt that their culture had been undermined and that it had not been given equal value in comparison with Eurocentric methods.

Historically, the role of domineering church practices and the impact of the residential school system had disadvantaged many Indigenous people and prevented them from creating equitable relationships with Eurocentric learning methods. They had also not been given the opportunity to develop pathways between Indigenous and Eurocentric learning models during the residential school era. Participants in the study felt that this unequal relationship between learning methods still existed. For some participants engaging in the study was like swimming to the surface from the bottom of a boisterous sea of Eurocentric educational context. As one participant mentioned, “Yeah, yes I did [learn a lot about my culture]. Some stuff I didn’t know about, [...] Like...all that sacred things” (Participant T). As this participant focused on learning about her culture through participating in the study, she was able to establish correlations with Eurocentric concepts that were taught in the classroom that she had previously not understood.

It appeared that the research participants had barriers that were defined and which suppressed their ability to observe cues or to shift from their ways of learning to the Eurocentric methods. For instance, participants grappled with many issues including their identity, the intersectionality of their culture to Eurocentric ones and the influence one seemed to have over the other. Most of the primary participants felt disconnected from their history and culture. When elements of Indigenous culture were introduced into the learning, participants seemed to use this opportunity to recreate their identity and then to apply concepts that helped them to succeed. One participant described this as follows

So but um, teaching, teaching has always been in me. All the time, even though I was going to school. You know, I dropped out many times during school. High school especially. All the time I would drop out. I would last about three months, four months, but I think that is because I wasn't interested in the things that they were learning [teaching]. You know if I learned about my people, you know the beadwork, the language, and the stories. You know like I probably would have stayed if somebody were to tell me you know it's good to be Aboriginal. You should be proud. You know I never heard that. And that's the thing that I want to pass on to my students (Participant O).

It would appear that the responsibility of swimming to the surface of Eurocentric learning was theirs. And because the intersection of Indigenous learning with Eurocentric learning had not been addressed – an issue that required a great degree of focus, planning and careful execution – learning that could have taken place here was unattained and participants may have consequently been left to drown. It was clear that participants made connection between their Indigenous learning context and Eurocentric learning contexts once learning involved elements that allowed them to associate their Indigenous cultures with the demands of Eurocentric learning. It seemed that this knowledge helped them to consequently aspire for better outcomes such as good grades or participant marks – factors that demonstrated success in a Eurocentric context. But control over how this kind of movement could be pedagogically and systematically instituted was never the responsibility of the student but that of their educators, administrators and institutions in which they learned.

Eurocentric education in its application within the study community seemed not to provide this basic Indigenous cultural scaffolding (Brown, 2003; Rowe, 2012) or the bridge needed for participants to connect their learning to their own Indigenous essence or cultural identity. An

observation from this study concerned a noticeable improvement in participants' learning when they seemed to unearth the need to assume responsibility for constructing the necessary bridge and scaffold between their Indigenous learning methods and the Eurocentric learning paradigm. This was evident by their desires to implement methods that recognized Indigenous learning methods in their classrooms, and to pedagogically help their students construct scaffolds and bridges from this base. Participants seemed to have adapted and oriented between contexts by displaying these sorts of decision-making ability where they previously had not.

Primary participants felt that they had gained better understanding of their culture and self-worth because of these approaches. This notion of the equitable intersection of learning contexts is interesting and may hold promise for learners in Indigenous communities. Participants seemed to understand that recognition of their culture, as the basis from which all learning including Eurocentric ones could be scaffolded, was important for cognitive movements to take place.

We often use the notion of frames of reference to understand movements in our environment. For instance, metaphorically, we say, we have an understanding of "there" in relation to "here", and vice versa. What may be challenging for Indigenous learners though is the initial hurdle of settling into and becoming comfortable with the Indigenous learning context that they find "here". And then to be able to construct the "bridge" (Aikenhead, 1997, p. 225) between that context to the Eurocentric one over "there"; and after that to construct the scaffolds necessary for moving back and forth between here and there. Participants in the study seemed to be able to exhibit these kinds of back and forth movements. But this was not so at the beginning. One participant described her initial hurdle of understanding her Indigenous learning context as follows

Well the stuff that I learned here... all shot at me at once because I...was never really even taught it in my school...We were taught the fur trade, but they didn't really go into full details like this program did...The main thing that stuck out to me in the first two years when I was going to school was colonization...What does that mean? So it started, like, shooting at me with all this information and I was, like, trying to get it all down, right. And I was like, ...never even realized it (Participant D).

For most learners, it was a bombardment of information that seemed to challenge their understanding of culture, their identity and self-worth. Even though a well-intentioned decolonizing technique may have been used to reinforce their identity, delivering these concepts in a Eurocentric format appeared to produce outcomes that may be in contradiction to expected Indigenous learning gains. An alternative approach, is one in which an Indigenous culture-centric approach is used as the leverage point on which those lessons are built. This approach might have produced much more desirable outcomes that are different and more amenable to the learner.

5.2 Beyond Basic Telecommunication

The study indicated that digital technology does provide an affordance for learning that could improve learners' ability to understand the notion of equitable intersectionality between worldviews. The use of digital technology such as mobile phones for learning could benefit from a robust internet infrastructure. Even though the study community's telecommunication and internet infrastructure was recently upgraded to allow participants to share, collaborate and conduct research on their mobile devices, the bandwidth capacity of this infrastructure was insufficient for value added services such as tele-medicine and distance learning. *Good telecommunication infrastructure is a determinant for learning in this context.*

Good and robust infrastructure, among other things, consists of technology that is capable of carrying internet traffic in and out of the community. Good and robust infrastructure should be one step in the direction of addressing the massive digital divide in the study community. Such infrastructure might include large capacity fiber optic cable, different from the radio infrastructure currently implemented in the community. An infrastructure of this nature would allow community members to transmit and receive large volumes of information to and from other Indigenous communities in the province and across the country. One challenge of implementing an infrastructure of this kind relates to its cost.

Because Indigenous communities are often remote and far removed from urban areas the cost of implementing telecommunication infrastructure is cumbersome and challenging. The Canadian geographic landscape further poses real challenges to telecommunication companies. The sparsely populated population across vast expanse of land makes it uneconomical to deploy infrastructure that might only be used by a few people. The geographic terrain consisting of prairies, hills, lakes and rivers that freeze and thaw depending on the time of year further makes infrastructure implementation a challenge.

Consequently, the absence of suitable infrastructure complicates the task of say, doing electronic business, delivering better health care services, or extending government programs and services to the communities located in these far-flung communities. This situation creates an ideal environment and offers tremendous opportunities for innovation.

For instance, this situation is suitable for innovation in the area of medical health, i.e. for creating remote diagnostic equipment and for creating practices that support remote health delivery. It is also suitable for innovation in the delivery of government services, i.e. for extending government services to individuals in remote communities. This unique geography creates an

opportunity to develop new technologies. The outcomes of innovative solutions could be applied to contexts where similar challenges exist, whether in Canada or elsewhere in the world. The infrastructure present at the time of the study was not robust enough to perform the aforementioned services despite its recent upgrade. However, it was sufficient enough for one participant to describe his experience as follows

Before this thing [mobile telecommunications], we didn't have that [digital technology], we have to travel, we have to write letters and even at that, the time it takes to send [a] correspondence...[was long]. Now [it] is instant. You send a text message through email. I can't imagine, [what we did] before the email. When I first started in 1990, we [were] still using getstetner, [...] we crank it, and teachers line up in the morning, trying to use [it].

(Participant N)

Participants believed that the digital technology did provide some affordance that helped them to improve their practices. In its simplest forms, the use of basic applications such as text messaging had contributed to the social and economic growth of the participants. Impacts had been felt in cost savings and the time that community members spent on mundane services. Whatever quantity of cost-savings had been made is still subject to further research that could help to determine the long-term direct benefits of available digital technology to the study community. It could also help to determine cost savings that accrue from providing similar services to other remote communities and to the broad Canadian society. Arguably, when education related issues are addressed, particularly in the areas of narrowing the gap between Indigenous learners and other Canadians, social gains could result that might benefit first Indigenous people economically and socially and then to all of Canada. Because of its potential significance to learning, one more

case for a robust “backbone” internet infrastructure in the community should be made, even more so that it is necessary to address the digital divide in the North.

5.2.1 The Case for Better Infrastructure in Rural Manitoba

During the research, the backbone radio terminal infrastructure in Bunibonibee Cree Nation was upgraded from the previous CDMA to an HSPA network as recently as in April 2016. For the first time community members were able to use data services on their smart devices for emails, participate in social media and roam outside of their communities without requiring services such as Wi-Fi. Because of this, there was an influx of new devices into the community that were capable of data communication. Consequently, community members bought appropriate devices to help them leverage the infrastructure. The closest technology stores in Thompson which was about 186 kms away, that took 7 hours to travel by winter road or approximately \$400 for a return airfare ticket, ran out of smart mobile devices. The demand for appropriate smart devices that were capable of data and voice communication was very high. One participant reported

Yeah and people were getting that [mobile devices] and once we got the other service, the 3G service, people were just getting iPhones and I guess Thompson was...like the store was sold out of a lot of their computers and stuff (Participant X).

Why did it take so long for this upgrade to take place? For telecommunication companies such as the Manitoba Telecommunications Service, it boiled down to the cost of deployment – the economic sense to justify an upgrade that would clearly not generate enough revenue to cover its investment costs. Here cost had been described in its purest economics sense, i.e. of deploying the infrastructure. Simply put, can the investment be recovered over a short period of time without substantial loss of revenue? This model for calculating profitability did not consider the social,

cultural or environmental value that may accrue to the Indigenous communities in question or to the country as a whole. A more holistic model should rather be one that encompasses not only profitability from an economic perspective but from the social, cultural and environmental perspectives too. Consideration that encompasses all of these aspects is more likely to be profitable in the long run.

In the absence of an economic incentive or financial “carrot” such as clear-cut revenue gains or even tax breaks, private companies in the manufacturing or telecommunication services sectors might not feel incentivized enough to deliver services to rural communities. Regulation is often an alternative to the use of market forces. The “stick” of regulatory mechanisms could compel service providers to deliver essential services to communities that need them. There are legislations and regulations that compel government and service providers to make infrastructure available for all. At one level, instruments such as the *Canadian Freedom of Information Act*, and the *Canadian Charter of Rights and Freedom* implicitly compel governments to ensure Canadians, irrespective of their location, have rights of access to information and knowledge. Today, good internet is fundamental to accessing information and knowledge. At another level regulatory provisions such as the *CRTC’s Telecom Regulatory Policy of 2011* provide an “Obligation to Serve” and “Basic Service Objective Clause”. These instruments recognize that “virtually all Canadians, regardless of whether they live in urban centers or in rural and remote areas, benefit from having access to internet services using a variety of technologies including wireless and satellite technologies” (CRTC, 2011, p. 2). They assert that

This should ensure that all Canadians, particularly those in rural and remote areas, could benefit from a greater level of broadband connectivity. In this decision, the Commission establishes target speeds of 5 megabits per second (Mbps) downstream and 1 Mbps

upstream. These speeds should be available to all Canadians, through a variety of technologies, by the end of 2015 (2011, p. 2).

Three mechanisms for broadband internet are proposed in the policy. To ensure:

1. The establishment of a funding mechanism for broadband internet access.
2. The establishment of specific target speeds that support basic services.
3. The inclusion of broadband internet access as part of the basic service objective (Obligation to Serve) that service providers such as the Manitoba Telecommunications Service must adhere to.

In the first mechanism the CRTC supports “market forces, and targeted government funding [as approaches] that will drive the rollout and implementation of broadband internet access in rural areas” (CRTC, 2011, para. 63) but rejects the provision of a funding mechanism that would subsidize the deployment of broadband service.

Concerning the second mechanism, it recognizes the ubiquity, speed and importance of internet access to Canadians irrespective of their location, and agrees that all

Canadians should have access to a broadband internet access service that allows several users in one household to use the World Wide Web (alpha-numeric text, images, and small video files), voice over internet protocol services, and other online services (such as email and banking) over a single connection at the same time. With this type of access, users will be able to actively participate in online discussions, take advantage of many government services, and carry out research, to name just a few possible applications. The Commission also considers that a broadband internet access service should allow a single user to stream higher-quality audio and video and to participate in video conferencing at reasonable quality using online services. This capability will enable users to engage in such activities

as participating in distance learning and online consultations with professionals (basic e-health). To accommodate such uses, the Commission considers that the appropriate target speeds for broadband internet access service are a minimum of 5 Mbps download and 1 Mbps upload. The Commission notes that, while many Canadians in urban areas already have access to broadband internet services at or above these target speeds, such speeds are not currently available to most Canadians in rural and remote areas (CRTC, 2011, paras. 74, 75, 76)

The Commission agrees that these services should be provided to Canadians regardless of geographic location. It set a date of December 2015 for achieving the above defined target speeds. This had not been realized at the time of writing this thesis in 2017. In order to ensure compliance, the Commission collects and analyzes data collected by service providers and is required to revisit the targets should it need to do so.

Concerning the third mechanism, the Commission has refused to include broadband internet access as a basic service objective, and therefore service providers may not be compelled through regulation to provide services to those in need. This provision is not included in the “Obligation to Serve” for service providers. This suggests that while the second provision was well intentioned, the third provision removed the bite from the second. One gives, the other takes away, making this intention for acquiring broadband internet access in rural communities impossible to attain. The mechanisms become ineffective and non-beneficial to rural communities such as Bunibonibee Cree Nation. As a result Canadians especially those in rural areas are unable to apply pressure on service providers for required services.

Without a robust telecommunication/internet infrastructure, services that support voice and data on mobile devices will be absent, and could impact learning with technologies. Demand for

broadband existed within the communities as indicated by the increased purchase of mobile devices when the network was upgraded in April 2016. During subsequent visits after the upgrade, research participants and community members no longer relied on their computers as the sole means of accessing the internet. Research participants were able to bring their own devices (Ballagas & Rohs, 2004) and to use them to perform the study's activities. Participants used their devices to produce the cultural digital artifacts.

Different organizations in the community such as the high school, the school band office, the band council, the Royal Canadian Mounted Policy (RCMP) office, the airport, the medevac unit, the nursing station, and the University College of the North Center, had to provide their own telecommunication infrastructure. They paid very exorbitant telecommunication prices for individual satellite installations. And they paid for these services separately.

In the urban areas, a Shaw Go internet bandwidth providing up to 5Mbps download and 0.5 Mbps upload speed has an introductory price of \$35, a significantly lower price than the nearly \$2500 monthly fees (2016 figures taken from discussions with community members) paid by the University College of the North center for far less quality bandwidth. Collectively, the various institutions in the community paid upwards of \$10,000 per month for internet connectivity. Such pricing is unsustainable in the long run. The savings from paying for cheaper internet could be put to better uses. Ultimately, the opportunity cost of paying for bandwidth presently is the cost of investing in other important socio-cultural needs in the community, including education.

It is clear that the upgraded infrastructure was a far cry from the CRTC's 2015 targets. And it was not sufficient to meet the needs for bandwidth that the community required. Neither was it sufficient to meet the needs for learning across the campuses of the north. The most

appropriate infrastructure that would support present and future demands for bandwidth and that would meet the set CRTC targets must be carried by infrastructure that could support that kind of service. “Fiber is really what’s going to resolve the issue” (Participant J).

While bandwidth over satellite terminals is appropriate for remote locations, it appeared to be a short- to medium-term solution. The quality of voice and data transmission tends to degrade on satellite. Satellite technology may be less capable of carrying the quality bandwidth demands for education in the present and most certainly in the future. More so, internet applications of today are bandwidth hungry and demands for real-time quality access surpassed the capacity provided by the recently upgraded infrastructure. Fiber optic cable installations would provide longer lasting solutions for value added services such as tele-health and education and would definitely increase the potential for research in these communities.

With the implementation of fiber across the various communities, community members would have the infrastructure that would enable them to attain the goals specified by these regulatory provisions, attain the *Digital Canada 150* goals and provide the basis for access to information and knowledge. This infrastructure could then allow learners to apply digital technology for learning and also for cognitive movement between Indigenous and Eurocentric learning.

Implementing the right infrastructure alone is a step towards attaining these goals. The announcement of \$4.2 million to cover the cost of implementing fiber that will deliver high-speed internet to all 63 Manitoba First Nations Communities (Jillian Taylor, 2016) is a welcome development. Building the value added services on this infrastructure that could provide the most gains to the communities involved, is perhaps the biggest challenge and where the most value could be realized.

Some considerations are needful here, that the cost model for implementing technology should be more holistic, taking into consideration other socio-cultural aspects. For instance, value added services such as education, should form a key part of the consideration (Diamond & Roberts, 2012). And that decisions involving infrastructure deployment across northern communities should be a collaborative endeavour that involve various government departments, levels of government (Chief and Council, local, provincial and federal government) and stakeholders including infrastructure providers such as the Manitoba Telecommunications Service, education institutions and other services in the community.

The presence of a robust backbone fibre infrastructure is a determinant required for learning in these communities. Addressing this fundamental infrastructural challenge could contribute to advancements in learning where, for instance, its use could improve learning outcomes and subsequently facilitate better understanding between Indigenous and Eurocentric learning methods.

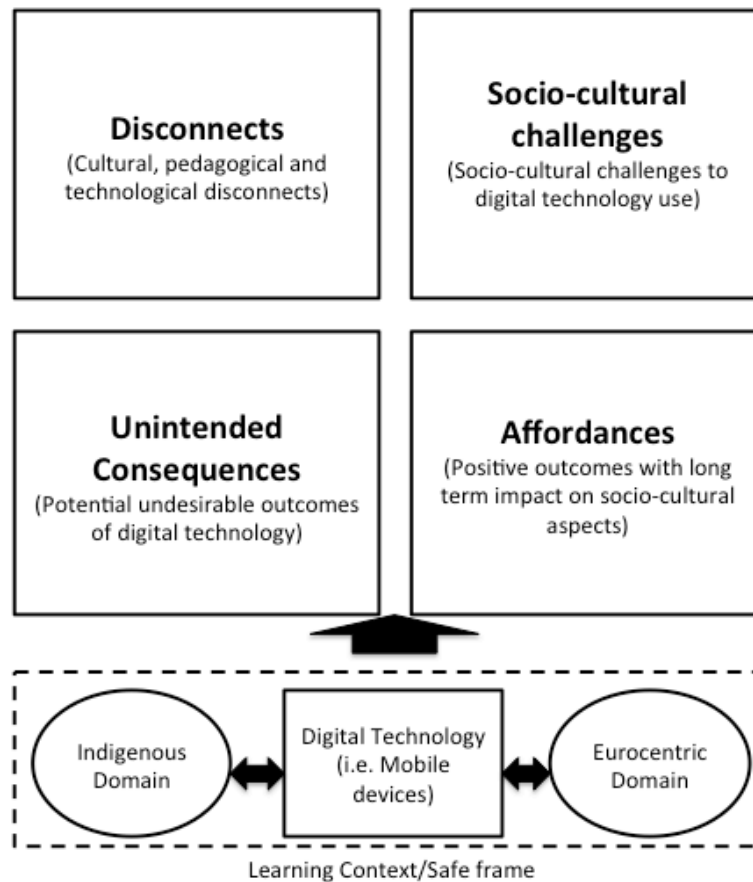
The Techno-Culture Adaptive Framework is presented as a tool that educators could use to explore the affordances that digital technology has for culture-centric learning in an Indigenous community.

5.3 Techno-Culture Adaptive Framework (TAF)

The Techno-Culture Adaptive Framework was presented in Chapter 1 as a conceptual framework that was inductively generated through grounded theory approach (Charmaz & Smith, 2003; Strauss & Corbin, 1994). Grounded theory seemed to be appropriate because it allowed for the inductive postulation of theories through systematically gathering and analyzing of the study data. It allowed for better understanding of the realities of the research context.

The Mobile Technology Mediated Adaptive Orienteering Framework was initially intended as a conceptual framework for the study. It was sufficient for framing the research idea and for gaining an appreciation of Indigenous and Eurocentric concepts of learning, for understanding the various variables involved in the study and for identifying the relationships between them (Maxwell, 2013, p. 39). But complexities that are associated with this study, such as the use of digital technology to produce documentation in the study community and the unique insider/outsider profile of the researcher required the construction of a framework that was more responsive to the research context. The Techno-Culture Adaptive framework was developed to incorporate these complexities.

Figure 5: The Techno-Culture Adaptive Framework



The idea of refining the conceptual framework was to ensure that the outcome of the research was less ephemeral and more practical and that the resultant framework more appropriately responded to the learners' learning context. Practitioners such as educators may seek to consider this adaptive framework, as a basis for designing appropriate learning pedagogy for their learners who may require using digital technology to produce documentation for their practices and who may want to explore the factors that influence learning success in their learners' context.

The following questions guided the review of the previous conceptual framework leading to the Techno-Culture Adaptive Framework. Does the conceptual framework adequately:

- a) Reflect the realities of the research context?
- b) Capture the outcomes of the study?

The *Mobile Mediated Adaptive Orienteering Framework* based on phenomenological orienteering (Atleo, 2001), an evaluative schema on motivation and perceived value of virtual policing training (Bertram, Moskaliuk & Cress, 2015) and the concept of *lostness* in a virtual world (Edward and Hardman, 1989) framed the data-gathering component of the study. The *Mobile Mediated Adaptive Orienteering Framework* also guided the formulation of the research ideas.

The Techno-Culture Adaptive Framework has two parts comprising of the *inputs* that describe the contextual variables that were present in the study community and the emergent *outputs* that describe the determinants that should be present for Indigenous learners in the research context to adapt and orient between multiple learning worldviews.

5.3.1 Contextual Variables

The first part of the framework consists of the inputs, which describe the domains present in the study. These included both the Indigenous learning domain of the learner and the Eurocentric learning domain in which they were required to academically succeed. Digital technology was used to produce documentation as participants moved between both domains. Digital technology such as mobile devices was used to record videos and voices and to take pictures. Participants used these devices to create digital artifacts such as family trees, videos and voice recordings that they later analyzed. They also documented their analysis by creating blog posts, video recordings, or simply writing their thoughts as reflections in notebooks. Participants discussed these artifacts among themselves in a collaborative learning manner similar to practices that are consistent with constructivism (Keaton & Bodie, 2011; B. Kim, 2006; McDonald &

Ingvarson, 2010). They were also able to explore the use of these artifacts in their classroom. Participants who were teachers shared and discussed them with their students. The mobile device was selected as a tool of choice because it did not appear to disenfranchise the learners because every one seemed to own their own mobile device. They were very familiar with the functionality of the device and they all seemed to have similar kinds of access to the internet.

The second part of the framework consists of the outcomes that emerged from analyzing the research data (see chapter 4). These outcomes include:

1. The technical, community, and cultural **connects and disconnects** resulting from the application of digital technology for learning.
2. The **socio-cultural challenges** of digital technology implementation.
3. The **unintended consequences**, which produced positive and/or negative impacts on the community.
4. The **affordances** of digital technology for creating connections between the past, present and future, for fostering learning and for creating a sense of identity.

These outcomes were themes that categorized the determinants of learning with digital technology in the study community. The specific outcomes were highlighted in chapter 4 and subsequently presented here.

An important observation is that there was a need for a frame that allowed participants to confidently use digital technology for their learning and to use the technology to explore practices that helped them to adapt and orient to the cultural domains present in their learning context. The emergent “safe frame” was a structure that contained the protocols and policies that guaranteed ethical relationships between the researcher, participants and community members involved in the study. This notion of a safe frame might also be useful in conceptualizing a safe structure for adult

learning to include other members of the community. In addition to the set of protocols and policies, the safe frame was a medium (McLuhan, 1994) for safe sharing of information and for using digital technology.

The frame provided an impression of “oneness” with all the elements in it. It seemed that the people in the frame assumed the same “life” with its elements. One participant expressed this notion of oneness as follows:

The person giving training [or sharing information] is “living the life”, and the person receiving the training [or information] is also “living the life” of what is being taught rather than just [...] seeing the video. That intimacy is what we... I guess we treasure (Participant N).

This idea of oneness with the elements in the safe frame is consistent with McLuhan’s concept of the medium and the message (McLuhan, 1994). While the metaphor, “do not shoot the messenger” may be used to cognitively separate the bearer of the message from the message and its source, McLuhan argued that they are one; the medium is woven with the message and that the message cannot be conveyed without the medium. The previous quote seems to suggest that the message had to be “one” with the messenger and by “living the life” with the message, the messenger is inseparable from the message.

This concept of oneness of the messenger with the message is similarly not too distant from that of Heidegger’s “essence” of technology (Heidegger, 2007). Philosophically, there seemed to be a “spirit” of a message that accompanies it. The message is never intended to be alone. It is always one with the bearer. It is also one with the source of the message and one with the recipient. The force that unifies the source, the bearer and the recipient is the “spirit” of the message. The spirit of the message may be described as the intent of the message’s source. As

another participant mentioned, “The stories, grandma used to tell us stories, whether its myth or not, we know that behind any myth there is a lesson” (Participant N). Though we associated the message and the messenger or the content with its medium, it was the spirit or the essence, often encapsulated by the medium, usually a myth or story, that was most important.

Unraveling the meaning of the message produced cognitive movement that required the hearer to move from one domain to the other. Hearers of the myth or story are likely to seek a resolution that is consistent with their realities. Stories were not told just for the sake of telling, but for the lessons they produced and the meaning they make in the hearer’s reality. The hearer usually applies the spirit of the story in their lives based on the meaning they make of it. The story about “*Nanabozho*” (as told to me by an elder) for instance required me, the listener to cognitively shift from perceiving *Nanabozho*’s identity as that of a “trickster” to that of the wise spirit. Even though the story of a “trickster” is told, the real meaning, the spirit of the message or the “essence” intended for the recipient, is in the “wisdom of the wise spirit”. This is very much consistent with the stories my mothers and elders told in my Indigenous African community. In this form, the story had meaning beyond the apparent pleasure derived from hearing a story. It allowed me to see the essence and the spirit of the story and to generate deeper meaning from it.

It could be that participants of the study might have been unable to cognitively shift from the domain of Indigenous knowledge where stories are told to the domain of the Eurocentric learning where meaning is intended, and vice versa. This inability to shift cognitively might have resulted in an inability to generate deeper contextual meaning in the lessons taught in the Eurocentric context. Indigenous learners might have sought after an encapsulated essence inherent in the stories and lessons received in their classrooms; similar to what they would have done when they receive stories from elders. But they might have found none or they might have been unable

to make the transition to generate the intended meaning. Because participants could not make these connections and transitions between the stories and their meaning, cognition might not have been attained. This does not mean that the lessons they were taught in the classroom using Eurocentric strategies might not have conveyed meaning. It simply means that they were unable to make those connections. Learners may have had to develop other strategies that might work for them in order to at least meet the requirements of Eurocentric learning. Those who could do so might have imbibed the lessons through strategies such as memorization, rote learning, remembering and regurgitation. Learning might have taken place but only to the extent that they remembered the message. And when such strategies failed some lessons might appear to have been learned but acquisition of knowledge might not have occurred.

Because the bearer of the message, the educator in this case was required to “live the life”, and the recipient of the message, the learner in this case was also expected to “live the life”, the learner had to be allowed the opportunity to cognitively engage with, decipher and apply the lessons learned from the message in his/her life. The hearer of the message then transforms to become the new bearer of the message who is also expected to continue to “live the life”. In this form, the essence of the message is transferred from one to the other and from generation to generation. This kind of transmission can be done through storywork (Atleo, 2009).

For participants in the study, learning seemed to take place in the cognitive deciphering of the message of the story. Learning may or may not have taken place in the simplistic absorption of the content as divulged. Of course, this observation does not necessarily denigrate Eurocentric learning as content without context; Eurocentric learning does have its own myths, practices and values. And for learners to learn in this context, they might have to make the connection to the essence of the message that is in this Eurocentric domain from their Indigenous domain. It is

however important to highlight that Indigenous learners in the study were able to cognitively decipher the messages they received in order to gain a better understanding of their learning. It is in the understanding of the notion that learning about concepts told in one domain might actually produce meanings or essence in other domains, that learning could actually produce more gains.

Knowing that the safe frame encapsulated many elements, i.e. the message, bearer (educator or researcher), recipient (participant or learner) and the medium (digital technology), principles for working with the community had to be conceived in line with these elements and the value they give to learning in the message's recipient Indigenous domain. Resources such as the resolve to build confidence in the participants and the will to invest time and effort were essential for building and solidifying the structures of this frame

Yes, how much will the person using the technology [be] willing to invest? He will have to earn the trust of the audience and the intended student. So like I said, all these things are tools. They are for our benefit (Participant N).

Researchers and educators using this framework should therefore be willing to consider questions related to the construction of this safe frame. They should ask themselves:

- a) What is my personal code of ethics and how aligned am I with that of the research/learning community?
- b) How authentic am I about this lesson I teach or the research I conduct and how do I reflect and “live the life” of my research or lesson?
- c) What technology would I use and what assurances can I project in its use so that research participants and learners do not feel unsafe and threatened?

These questions are essential for the researcher or educator to be constantly reminded to maintain the integrity of the safe frame.

5.3.2 Determinants

From analyzing the research data, several determinants emerged from four broad themes (see Table 8). As already mentioned, determinants are factors that produce expected outcomes or unexpected consequences that might have an impact on a people and on their community. By highlighting the determinants for learning in an Indigenous context while using digital technology to produce documentation, educators and learners would be able to identify these factors and to consider them in the process of learning. Four themes emerged from the analysis of the data and the emergent determinants are described within them.

Theme 1: Cultural and Pedagogical Connects and Disconnects

The first category of outcomes related to community members experiencing a sense of technological, community, cultural and pedagogical “connects” and “disconnects”.

Technology Connect and Disconnects: By purchasing new mobile devices after the community’s mobile network was upgraded, participants displayed elements of technological disconnects. The use of disposable income to make this purchase determined the extent to which participants were willing to spend on digital technology and services and to explore its use for learning (Akoh, 2005; Commission, 2013; Hellström, 2011). If they were unable to afford the required disposable incomes to make these purchases, they may have been unable to connect to the network and unwilling to use the particular digital technology for learning. The study’s observations reveal that learners made purchases for new devices when much better mobile services became available in their community. By this action they took personal steps to narrow the technology disconnect that they previously experienced.

Culture Connect and Disconnect: Participants felt disconnected from their community because of an absence of a platform for dialogue, collaboration and cooperation and a mechanism

for on-going dialogue between various stakeholders. Their use of digital technology could provide a digital platform for dialogue on community-related issues and concerns. Dialogue could commence ahead of face-to-face meetings which could help participants to “accomplish more because they have been engaging in an ongoing dialogue” (Fritschi & Wolf, 2012). It was clear that participants wanted to feel invited as evaluators and contributors to discussions that would help leaders to identify the challenges of education and to explore ways for providing solutions. Digital technology could be used in this context.

Pedagogical/Cultural Connect and Disconnect: Participants highlighted disconnect with their culture and expressed the opinion that digital technology could be used for learning. Participants, especially elders in the community felt that learners had been far removed from their culture. Elders thought that learners were engaging in far less outdoor learning compared to them. They felt that the absence of learning outside the classroom indicated a gap in learning about their culture.

The following determinants respond to the digital, pedagogical and cultural connects and disconnects in the community.

- **Determinant 1: The need for suitable and appropriate digital technology.** There is the presence of a significant digital divide in the research context. The absence of the right technology infrastructure prevented participants from benefiting from the learning that could have occurred. For instance, in the absence of a physical library or suitable internet technology, participants were unable to perform any form of research. They depended only on the knowledge and content provided by their instructors. Digital divide in this community limited participants only to the knowledge that they were given. A suitable and appropriate digital technology is essential for learners to use as a tool for researching and

for seeking meaning for concepts told in one domain, for which meaning might exist in another.

- **Determinant 2: Individuals with technical knowledge are required in the community.**

Because the presence of technology in and of itself does not translate to learning, appropriating whatever technology there is presently or whatever technology there may be in the future for learning may require the expertise of a qualified technical person to guide and to appropriate the technology within the learning context. Such a person must live in the community, has the community interest at heart and must be willing to collaborate with the different stakeholders in the community. It is the responsibility of this person to help articulate the needs of the community and its stakeholders to policy makers and those who might be responsible for the education of learners in the community. This person might be able to help the community to create a consortium comprising of the different users in the community. Through this consortium, they might be able to collectively negotiate for resources such as better pricing or even suitable technology for their community schools and services.

- **Determinant 3: A non-hierarchical platform for dialogue.** Because participants, especially parents of learners and other stakeholders, wanted a platform where they could freely share their thoughts, a platform that allows them to consistently participate in the sharing of knowledge and for collaborating on the learning of their children could be useful. This structure could allow community members the opportunity to include elements of their culture into the learning pedagogy of their students. It could be a platform where the technical person listens to the needs of the community members and articulates them to policy makers and community leaders.

- **Determinant 4: Culturally appropriated technology.** It is not sufficient simply to have digital technology. Digital technology, as a double-edged sword, may likely produce negative unintended consequence by default than positive affordance, especially in the area of its appropriation for learning. It is the proactive application of digital technology that is likely to produce positive outcomes. Culturally appropriated technology should be one that does not erase good aspects of the culture but that rather enhance it. The appropriated digital technology should be malleable to the learner's needs, the educator's pedagogy and to the cultural context in which it is used.

Theme 2: Socio-Cultural Challenges

An important observation related to the impact of trauma on community members and its subsequent impact on their learning. Pedagogical advances that could produce learning gains were likely challenged in the presence of trauma. In the learning contexts, participants refrained from talking about the trauma they experienced. Although they showed great strengths and displayed courage and resilience by making themselves available for the research activities, their pain could not be overlooked. For instance, it was difficult to overlook the fact that there had been two deaths in the community in a week during the period of the study. It was even more difficult to engage with the participants under these circumstances despite attempts at being affective and emotional.

Despite these traumatic challenges and in a show of resilience, participants made effort to continue in the study. Educators should therefore decide the most useful way of dealing with trauma or other emotional stresses in their learners' context and which their learners may be experiencing. In the Canadian Indigenous context, educators should recognize that trauma could be present. If they are equipped to deal with it, they proceed to do so in a culturally conscious way. If not, they should identify the right channels for doing so, i.e. by talking with an elder,

school administrator or their community-based research broker. Educators should be willing to adjust their schedules in response to the participants' availability. Trauma that may have emerged from age-long residues of Eurocentric influences on Indigenous culture such as residential schools continues to influence learning and to disrupt Indigenous foundations (Battiste, 2004).

Recognizing the presence of trauma is a useful first step.

It is important to also recognize Indigenous culture as an integral part of Indigenous learning. Educators using the Techno-culture Adaptive Framework should bring awareness of the community's socio-cultural challenges to the fore as they address the educational needs and aspirations of Indigenous learners. They should ask questions such as, what are the pressing traumatic issues that participants are faced with and what is the most appropriate response to address these issues?

For digital technology to produce learning gains in the community, this study argues that pedagogical strategies related to their use should fully recognize Indigenous cultural base as the foundation on which learning about other cultural contexts can be built or scaffolded. Examples that explore this notion of Indigenous culture as a foundation for scaffolding to other learning include the Indigenous Course Requirement (ICR) for first year students at the University of Winnipeg. Courses like this allow students to evaluate their values and beliefs against the integrity of the content that they receive. It also allows students to align their beliefs with the values and beliefs of the other cultural contexts that may be present in their learning environment. This process could help learners to create adaptation and orientation strategies between their own learning contexts and the others. Understanding the role of the learner's culture on their learning is an important determinant for learning in Indigenous communities. This determinant is presented here along with others.

- **Determinant 5: Digital technology that enhances culture-based reasoning.** Digital technology used for learning should be able to help the learners enhance their ability to reason culturally. Culture-based reasoning is the practice of reaching back into the memory box for pieces of cultural knowledge that could help participants to take decisions about issues with which they are faced (Young et al., 2010). It is the ability to pull relevant stories from the many stories, myths and legends that their elders and parents have told them and to draw lessons from those stories. This concept is consistent with narrative inquiry (D. J. Clandinin & Connelly, 2000). Digital technology that helps participants to recall stories and to engage in storywork in order to preserve knowledge for the future is an affordance of that technology to enhance culture-based reasoning. The feature of mobile devices to capture videos, pictures and voices and to use them to create stories, myths and legends is a useful contribution to culture-based reasoning.
- **Determinant 6: Safe digital technology and safe use.** While any technology could potentially be used for harm, i.e. as a tool for cyberbullying, they should similarly be capable of safe use. Digital technology in its form and structure should not be used to cause physical, mental or emotional harm. The parameters for safe use should be defined and all participants should adhere to them. Where guarantees of safety exist, it is likely that learners may feel safe to appropriate the tools for learning and educators may be willing to incorporate them into their pedagogy. For every negative potential of a digital technology tool, there is likely to be a positive appropriation of that tool. Helping students to unearth the positive over the negative could result in good uses of digital technology.
- **Determinant 7: A safe frame.** A safe frame has been defined throughout this thesis as an essential conceptual element consisting of protocols, policies and arrangements that allow

learners and educators to safely engage in learning. Even though a safe frame for researchers already exists in the form of research policies and protocols, there may be the need to adapt these for the learning environment. Clearly defined policies, protocols and arrangements for teaching and learning could be helpful for educators that leave from the provincial south to engage with learners in communities in the provincial north, especially for educators that are not Indigenous. These policies, protocols and arrangements should contain the inputs of community members. Inputs should respond to and include Indigenous elements that guarantee safety for the learners.

- **Determinant 8: Guarantees of privacy.** Participants in the community wanted to maintain their privacy. Even though they seemed to use digital technology in a way that was not mindful of this requirement. Participants seemed comfortable with sharing information outside of the safe frame that they had constructed. However, during the study, participants wanted to be assured that personal information would only be shared with those within the safe frame and not with anyone outside of it. Such guarantees were necessary prior to engaging with the research activities. Educators would have to grant similar assurances to their learners. They would have to assure learners that their privacy is protected and that their information is safely guarded. It may be necessary to incorporate guarantees of privacy protection into the learner's learning process and in their pedagogy. Such guarantees may be necessary before learners may choose to become more engaged in their learning.
- **Determinant 9: Assurances of equitable perception.** Historically, Eurocentric culture undermined Indigenous culture. Learners who perceived that their Indigenous culture was inferior to Eurocentric culture were unwilling to learn concepts framed in the latter.

Assurances that highlighted elements of Indigenous culture as being equitable with elements of Eurocentric culture seemed to help participants to transition from one context to the other and back. Assurances of this nature should be continuous until such time as it may no longer be needed. This may take several generations.

- **Determinant 10: Strategies to address trauma.** For several years, participants felt that they had been traumatized by the continuous death of community members and by the increasing numbers of self-inflicted injury cases that had occurred in their community. Some of these occurrences may have their roots in past historical influences, which may have produced negative impacts on the socio-economic wellbeing of community members. At the time of the study, digital technology had been used for cyber-bullying that may have led to self-harm, to loss of life and consequently to trauma on other community members. While the strategies recommended here may not specifically address the socio-economic needs of the community, they should nonetheless seek to address trauma caused by the use of digital technology. Pedagogically, educators should include strategies that mitigate the unintended consequences of using digital technology in the community.
- **Determinant 11: Firm Indigenous cultural learning base.** The notion that the Indigenous learner's context is a relevant cultural base upon which learning can be scaffolded is an important one. As a base, learners are likely to create the necessary scaffolds and bridges from their source domain to similar concepts in the target domains (Atleo, 2009). They are likely to do so if they can map concepts in one domain to similar concepts in another. Atleo described this process as "metaphorical mapping". There is need to therefore recognize that multiple domains are present in the Indigenous learner's context. These may include their own Indigenous learning context and the Eurocentric

learning context that is used to determine the level of education that the learner has attained. Learners may be able to build a firm cultural base if they understand that there are multiple learning domains in their cultural context, if they learn more about their culture through activities such as those described in this study, and if they learn to develop strategies that help them to map concepts between the domains present in their learning contexts.

- **Determinant 12: Challenge negative colonial strategies.** In addition to granting learners the assurances of equitability between cultures, pedagogies should allow learners to challenge any colonial strategies that may exist in their learning context. Educators should be willing to bring up topics of colonial imbalances for discussions in their classrooms. They should be willing to allow learners to develop their beliefs and to use them to challenge such imbalances. Educators should facilitate learning through research that helps the Indigenous learner to form their own opinion about colonial influences.

Theme 3: Unintended Consequences

The third category of outcomes concerned the unintended consequences of implementing digital technology in the community. The result of ignorance, error, vested interest or a mix of these appeared to produce negative consequences that led to adverse and harsh outcomes on those involved (Cuban, 2003).

Digital technology does not always produce affordances that may be positive. The impact of digital technology on society produced outcomes that could have long-term negative impacts (Hlynka, 2012; McLuhan & McLuhan, 1988). A critical review of digital technology's impact on the study community revealed that it had much more than positive tangible impacts. In fact, most of the impact of technology went far beyond what may have been comprehensible at the time it

was implemented. McLuhan's Tetrad for instance suggested that aspects of culture might be enhanced, made obsolete, retrieved from the past or reversed when digital technology is applied.

We may ask the following questions:

- a) What cultural aspects had digital technology enhanced?
- b) What cultural aspects had it made obsolete?
- c) In what ways had digital technology retrieved knowledge, information, and culture of the past?
- d) What aspects of culture had digital technology reversed?

The questions of digital technology enhancement, obsolescence, retrieval and reversal are pertinent to understanding the unintended consequences of digital technology for learning in the study community and for any other community for that matter. Some of these outcomes may be instantaneously foreseeable but others are not immediately glaring. When they are unforeseen, they may produce unintended consequences that may have very significant negative impacts on the community. It may be important to create future scenarios that project into the medium- to long-term impacts of digital technology in the community in order to, in the least, visualize their potential impact. Sometimes the outcomes of this sort of scenario exercise may prevent project implementers from implementing some digital technology if they, for instance, reveal that they may produce negative unintended consequences. Deeper levels of scenario analysis that reveal aspects of which McLuhan's tetrad refers, may be required for Bunibonibee Cree Nation and for other Indigenous communities where "more" digital technology is intended to be implementation. More study is required in this area.

Issues of bullying and the "disconnection" of people from their culture were two examples of the unintended consequences of digital technology's impact on the community.

Bullying, which in the digital context is referred to as cyberbullying, takes multiple forms, i.e. physical, verbal, social, ethnic, sexual and electronic (Dunlop, 2016). Cyberbullying is “repeated aggressive and hostile messages intentionally sent through electronic media” (Zych, Ortega-Ruiz, & Del Rey, 2015, p. 2). The intention is to provide harm and establish a power imbalance between the perpetrator and the victim (Casas, Del Rey, & Ortega-Ruiz, 2013). In a review of literature on cyberbullying, Zych, et al (2015) found that the perpetration rates are higher among boys than girls and that girls are more likely victims than boys in about 70% of countries studied. The long-term impact of bullying on children results in “aggression, anti-social behavior and substance abuse...and some of those young victims choose suicide as their way out” (Wayne McKay, 2012, pp. 7, 10).

Bullying as a practice is captured in the literature around the early 70s (Casas et al., 2013). Cyberbullying has taken new forms since then, especially with the proliferation of digital technology and the growing usage of social media and mobile devices. With the network upgrade in Bunibonibee Cree Nation, community members, especially younger adults appeared to have more access to information and knowledge about their peers. This infrastructure enabled community members to share rumours through their mobile devices. Cases of cyberbullying emerged and some community members became victims.

More studies are required to understand whether the growth of mobile and internet technology usage in the community has resulted in increased cases of abuse. Comments from participants seemed to indicate that they had contributed to incidents of cyberbullying. Preventative steps may be required so that other communities in the region are protected from experiencing similar outcomes like those reported in Bunibonibee Cree Nation, if they are not already experiencing these.

Indigenous culture based learning is holistic, encompasses whole aspects of life and spans the lifetime of a learner (Michell et al., 2008). It seemed that “reading, writing and arithmetic are no longer the most fundamental skills that [are] need[ed] to be taught in school, we must now also teach children about rights, responsibilities and relationships” (McKay, 2012, p. 16). Indigenous cultural relationships and values could contribute to our current construction of learning. But in a context where cultural relationships and values are not built into the curriculum from the onset, students are likely to miss the mark on the holistic importance of relationships and people and how these connect with their education. They may be unable to map the values of relationships to similar concepts in other learning contexts that may be present in their learning environment. They may also be unable to visualize the affordance of digital technology as a tool for strengthening community values and for building social relationships rather than its current uses for cyberbullying. A community centric approach is likely to yield a more desirable outcome in a context of technological abuse.

Cognitive movement from one learning domain to another as described in this thesis is consistent with this suggested use of digital technology for learning, one that recognizes and builds community-centric knowledge into the curriculum, and that draws students to learn from a “familiar” (Indigenous) place of knowledge to an “unfamiliar” (Eurocentric) place. The likelihood that young learners and community members will shift their focus from the ills that digital technology is capable of, towards its potential gains, could result in positive outcomes for the learners. It is important that the learner becomes more aware of digital technology’s affordances and that educators, administrators, and community people also embrace those affordances of digital technology that produce gains for the community.

This community-wide intervention is what may be required to address the other unintended consequence that was flagged in this study – that of digital technology as a tool for causing separation of people from their culture and tradition. Whereas its application may have disrupted the existing cultural practice of face-to-face communal gatherings, it could now be applied as a tool for bringing community members together around issues that concern them. It could be used as a tool to connect members living in community with those living outside the community for purposes of engaging them on community development matters.

As participants interacted on social media with the Grand Chief of MKO whose origin was Bunibonibee Cree Nation, they felt connected and thought that digital technology's affordance for creating connections had paved a more efficient way for them to engage with someone important. The use of digital technology seemed to remove barriers of communication that may have been previously present. Participants were keen to "follow" other people of prominence such as the Prime Minister. This was empowering for most participants. Whereas some unintended consequences resulted from the use of digital technology, the following determinants seemed to produce positive outcomes and are framed positively in order to indicate their benefit to the study community.

- **Determinant 13: Awareness concerning digital technology's unintended consequences.** Digital technology used in the research context was capable of producing negative unintended consequences. This outcome had a significant impact on the learners and on the socio-economic aspects of the community as a whole. There is a need to explore the potential emergence of negative unintended consequences and to develop strategies to mitigate its impact. There is a need to also raise awareness about the potential for digital technology to produce consequences that may be undesirable is one way and

desirable in another. Because they are unintended, it is likely that educators and the community might be unable to determine what these consequences might be. It is not the specific response to a particular set of consequence that really matters. Rather, it is the mindset to understand that consequences do occur and that when they do that there is likely a solution for addressing them and that it is the responsibility of the learners and the educators to find ways of doing so. Raising an awareness of this mindset is what may be required for learners to deal with unintended negative consequences of digital technology.

Theme 4: Affordances

Unintended consequences of digital technology are not only negative. They could also produce positive outcomes. In this study, positive outcomes are referred to as affordances. In the previous chapter, the first, second and third “systemic order” effects were used to describe the impacts of digital technology on the community. These “systemic order” effects are consistent with McLuhan’s tetrad because they explored the long-term impact of digital technology on society.

Some studies involving the implementation of digital technology conducted in Indigenous Canadian communities are typically centered on “tangible” affordances of the technology to the community (Mignone, Henley, Brown, O’Neil, & Ross, 2008; Mignone & Henley, 2009a, 2009b; Plante, 2005; Thiessen & Looker, 2008). Tangible affordances, as described in this thesis are those whose outcomes are physically visible in the short-term. The affordances of digital technology for helping students to improve their research or to connect with other members of their community are two examples of tangible affordances. These tangible affordances mostly highlight the positive impacts of technology on the community. In Indigenous contexts, the aforementioned studies tended to suggest that digital technology affordance increases the

opportunities to enhance student learning. They also suggest that digital technology affordance produces economic gains. While economic gains are important, other forms of gains are also significant.

Outcomes that are not often physical, visible or tangible such as the unforeseen unintended consequences that this study has revealed are equally important. The intangible affordances of digital technology described in this study have long-term effects. Long-term effects tend to produce outcomes that have lasting impact on the community and its members. The affordance revealed in this study such as those related to strong feelings of self-awareness and self-identity could have long-term effects on individuals and consequently on the community. As participants became self-aware, they began to explore deeper levels of self-fulfillment that they could gain from digital technology. For instance, they wanted to feel safe and to communicate safely, they wanted to cognitively connect with community members outside their immediate community and they wanted to explore deeper levels of satisfaction that digital technology produced beyond the superficial satisfaction-levels associated with the mere use of social media.

Dunlop (2016) described the “feel good” factor as a measure of positive connectedness between individuals in a community. Her study, which was about youths, described their experiences with bullying and its impact on mental health. She suggests that feeling good is an important condition for community members to feel positively connected. Learners who feel good about their place in school seem to indicate that they have received respect and that this kind of learning context is likely to help them succeed (Toulouse, 2008). When they do not feel good feelings of insecurity and apprehension tend to creep in and weaken their resolve; they eventually drop out of school (DeRemer, 2002).

While it is the responsibility of learners to “feel good” about themselves and their learning, educators, school administrators and the learning institutions as a whole should also assume some responsibility for creating, propagating and fostering a supportive learning environment for learners. Such environment would likely encourage them to feel good about themselves and their learning and could lead to success for some students. This study has suggested that learning from a familiar Indigenous domain from which scaffolds can be constructed to other learning domains could help to remove the uncertainties and could reduce the apprehensions that many Indigenous students have of learning concepts, especially those from the Eurocentric domain.

Perhaps, what is most assuring for learners is the freedom that digital technology offers them to adapt to different learning styles that lead to the production of new knowledge. As participants in the study accessed more content they were likely to produce new outcomes. They also seemed to be in control of their learning when they engaged in community-centric activities. As they gained more control of their activities they were willing to switch roles with the educator. They became the experts in directing community learning aspects of the study. Switching of learning roles allow students to gain more confidence in their learning (Billings, 2016; Brame & Assistant, 2013; Bristol, 2014; Touchton, 2015) and to subsequently acquire higher levels of cognition (Touchton, 2015).

This section presents the affordances that emerged from analyzing the themes from this study.

- **Determinant 14: Link to culture.** The affordance of digital technology to link people with their culture helps the learner to connect with core aspects of his or her identity. By aligning their identity with the culture, they were able to identify the concepts in their Indigenous learning domain that could map to concepts in the Eurocentric learning domain. They were

also able to construct the necessary scaffolds from one domain to the other. This affordance of digital technology to be used as a tool to link aspects of Indigenous culture may not be inherent in most digital technologies. However, it is the critical review of the potential impact of this digital technology on the culture that may reveal whether or not that digital technology could help individuals create links to and with their culture. In this study, the digital camera was used to create artifacts. These artifacts would be available for future generations to connect with their past histories. It is the responsibility of educators to help their students to explore the affordance of digital technology for reminding future learners about their histories. Digital technology has an affordance to create histories that link individuals to their culture. Linking learners with their culture could help them to be grounded in their learning domain and from it to develop scaffolds to other learning domains.

- **Determinant 15: Transform culture and practice.** On the occasion of the loss of a loved one digital technology seemed to affect the traditions of communal visits to the bereaved. This tradition is important to community members who may want to see that it is preserved. However, as the use of digital technology became prevalent in the community, this tradition of communal visit appeared to have been disrupted. Digital technology has the affordance to transform existing cultural practices and traditions. Educators should therefore make sure that learners are aware of the affordance of digital technology to disrupt and transform existing traditions and cultures. They should also be made aware that digital technology could enhance these same existing cultural practices in other ways.
- **Determinant 16: Provide entertainment value.** Participants felt that digital technology produced a “feel good” feeling. Participant also felt entertained. Learners might want to feel good about their learning and they might want to be entertained during their learning. A

learning environment, especially one that utilizes digital technology to produce such good feeling and entertainment while learning might likely contribute to learning satisfaction and might encourage learners to persist in their learning. Learners who persist because they feel good and entertained are likely to complete their learning. Perhaps this is a key to the challenges of attrition amongst Indigenous learners. Further research is required in this area too.

- **Determinant 17: Confidence creation.** Two aspects are important here. The first concerns the cognition and the technical knowledge of digital technology required to produce positive affordances. The second concerns the learning individuals' ability to confidently use digital technology to communicate about issues related to their socio-economic development. In the study, as participants produced digital artifacts their knowledge about digital technology increased while learning cues about the technology itself reduced. The participants became more familiar with the affordance of digital technology. This generated some confidence in them in the use of the digital technology. The focus was no longer about learning *how* to use the technology. It was about *what* the technology could produce. As a result of increased confidence they began to use the digital technology for more positive affordances, such as for communicating with policy makers and for interacting with others outside the community.
- **Determinant 18: Capable of Exploring New Affordances.** Participants seemed to conceptualize new ways of doing things and new ways of becoming more inquisitive about their learning. Participants used digital technology to conduct research and to engage with other members of their community. Those who were teachers wanted to explore the affordances of digital technology for learning outside their classrooms and then to bring this learning back inside their classrooms. Educators should adopt pedagogical strategies that

allow students to explore approaches of applying digital technology to create new knowledge or to explore new ways of doing things.

- **Determinant 19: Preserves history; creates history.** As participants became more confident in the use of digital technology they transformed from being mere consumers of content to creators of content. By creating cultural digital artifacts for historic uses, they were creating a part of history about their community for future generations to access. Educators should explore the affordance of digital technology to create historical artifacts that can be preserved for future consumption.

The determinants of learning in an Indigenous context in which digital technology is used to produce documentation as described in this thesis are by no means conclusive. Neither do they completely describe all the challenges of learning with digital technology in the Indigenous community in which this study was conducted. There are certainly other factors that may emerge if the scope of the study is expanded. For instance, the determinants could be refined if learners in the high school and elementary schools are included in the study or if learners in other northern communities are involved in the study. As a study, which utilized grounded theory to generate the Techno-culture Adaptive Framework, the determinants should be tested in other Indigenous communities with similar learning conditions in Canada or elsewhere to determine if they hold up. More research may be required to refine them.

By identifying and exploring the emergent themes and by identifying some determinants in the study, it is well worth asking, what do these all mean and what are their impacts on the participants and their learning?

5.4 Impacts

The impact of the study on the community was threefold. Primary participants were able to experience impacts that may significantly guide their practice as teachers and educators in the community:

- a) Participants seemed to have created a renewed sense of identity.
- b) Participants appeared more empowered as learners that took ownership and responsibility for their learning.
- c) Participants seemed to become more aware of the larger ecology of learning in their community.

a) A renewed sense of identity

As participants gained more knowledge about their culture and as they created scaffolds between their Indigenous learning domain and the Eurocentric domain, they also displayed a renewed sense of identity and self-awareness. Participants exhibited increased knowledge of culture and self-worth similar to Hollingworth's (1932) concept of learning. Learning was said to have occurred when participants were able to progressively reduce a substantial amount of cues as they moved from one learning domain to another. Participants seemed to reduce Eurocentric learning cues and they seemed to adjust the cues as necessary, depending on their position in the Indigenous-Eurocentric learning continuum. These movements produced positive effects that translated in-turn to social benefits to the community. For instance, a sense of self worth and identity seemed to lead to minimal self inflicted pain or abuse of others. One participant described this as follows

But I do believe if we do allow the children the opportunity to learn, I think we wouldn't have as much of the issues we have. You know, we have lots of vandalism in the

community. We have lots of drug abuse, alcohol abuse, and physical abuse. You know, domestic violence and all of these things, you know. I think if we could give these kids the opportunity to learn more about the native culture... they would get a sense of pride... I was a troubled youth. I was probably one of the worst kids you know, if you knew me back then. But after I started learning more about the culture, I did get a sense of pride... Like, “this is who I am, and this is what is missing” (Participant M).

Those who experience a renewed sense of identity and self-worth also experienced self-awareness. In addition to their learning, they also wanted to adjust their professional practice. For instance, participants who were teachers wanted to explore how they could introduce Indigenous culture-centric learning to their classrooms. They were constantly thinking about how they could take lessons learned in the community into the classroom and vice versa. For instance, one participant who was constantly preoccupied with thoughts about how he could introduce Indigenous culture into his class said, “like when I’m driving into town or when I’m just eating, you know, it’s just something that [I] always [do] – like what is one way I can just bring [culture] in [to my classroom] (Participant D)?

Other participants had learned to document their own Indigenous cultures by accessing and/or creating digital artifact using their mobile devices. Whereas in the past they relied on the oral traditions to pass stories and lessons from generation to generation, they seemed to have realized the affordance of digital technology to create documentation for learning, to create histories and to use it as a tool for sharing stories, cultures and practices. They observed that digital technology granted the affordance to help carry out these activities in a more structured approach that was consistent with their Indigenous forms of learning.

Digital technology had been destructively used for abuse. It had been used to disrespect many, especially elders who felt this way. As the following participant mentioned, the use of digital technology comes with responsibility. An aspect of this responsibility concerns the need to respect elders. In a case involving the introduction of cultural dances to the community, elders who were opposed to this idea felt disrespected when they were not consulted prior to the performance. Rather than use digital technology to disrespect the elders as they would previously had done, participants respectfully used it as a tool to advocate for their consideration in hosting the dance in their community. They chose rather to use their digital technology to document the dance in another community, develop a careful advocacy strategy and to use this strategy to present their video to the elders in a non-confrontational manner.

My colleagues and me were talking ...to just do it, you know. During one of the community festivals, we'll bring in a dancer ...just for entertainment and for... a little bit of educating them [the elders], too. But I think it would be good to document it, talk to the elders, because I was part of a group back in November where I was supposed to develop a lesson plan on history and our current issues today. This is one of the strong topics that I picked for my lesson plan (Participant M).

Participants felt that digital technology could be used to record some of the cultural events that they would introduce into the community. Participants seemed to realize that digital technology in their hands provided them the affordance of access to recordings of Indigenous activities in other communities. Access to such artifacts empowered them to speak up about issues that they would otherwise not talk about, such as to show a video to elders and let it speak for itself. The Arab Spring, the Occupy Movements and the Idle-No-More (Wood, 2015; Woons, 2013) campaigns were examples of empowered young adults who used digital technology to

challenge existing government structures in their communities. These examples were confrontational. But participants in the study community chose to use digital technology rather for peaceful negotiations instead of the more confrontational approaches of the aforementioned examples.

This renewed sense of identity reinforced their ability to negotiate on social issues with elders and to also shape perceptions of their culture. They were also able to extend this renewed sense of identity and self-worth to their careers and to shaping their future

Well I always wanted to be a teacher because my mom was a teacher and working here I always thought I would. [I thought] just the highest I could go was an EA [Educational Assistant]. I thought I was stuck there and I was very comfortable there. And then when the program came up I tried and I got in and what [stood] out [was] anybody can do anything. They can accomplish anything, no matter [what]. Even as a child I was told I was stupid, I couldn't do nothing, you know, and I believe a lot of kids are like that too. And I believe anybody can accomplish anything, to be a teacher, lawyer, or even to travel all over the world. And I always tell the kids they can go anywhere, 'you can do anything'. That, 'nothing is impossible' (Participant E).

Participants also experienced cognitive shifts that enabled new ways of doing things and which allowed them to explore lateral career movements or vertical growth paths. As one participant said, she could teach a grade much higher than she had done in the past

I'm not sure, I like the elementary school but...when I did my practicum in grade seven I really liked it there...It's like...I could talk to the students and they were able to talk to me. They were able to express what they were feeling, like if they needed to share something with somebody else there (Participant L).

Participants felt a sense of ethics and accountability in ways that challenged their morals and their moral relationship with others. Participants were able to challenge their moral relationship with the children in the community:

I used to do drugs. Well I didn't, like, not heavy drugs but like marijuana. I would drink alcohol at times, thinking that would help with the things that I went through as a child, things that I wouldn't want to share with other people. I won't pray for stuff anymore and if I want to be an educator I can't lie to my students and say, 'oh don't do this because it's not good'. You know it has to come from the heart. And you have to be honest with your students. [...] So even when I was working at the high school they would ask me, 'do you do drugs?' I said no, but I used to. I said you know I always used to think it helped but instead as I grew older, I don't need that kind of stuff in my life. Plus I have kids and I don't want them to see me doing that kind of thing (Participant O).

Participants seemed to develop coping strategies to help them navigate complex social issues. Instead of resorting to drugs or other mood altering substances during difficult times, this participant rather played the drums, sang or watched digital video artifacts of traditional Indigenous practices even though these practices were not allowed in her community, "So I still have my drum. From then I start playing it. Started singing. Youtubing videos. Getting a person to get CD's for me so I can practice the songs"(Participant O).

With a sense of identity came a sense of responsibility and ownership of their lives. Participants felt that they were responsible for their learning. They were able to create pathways between the multiple learning contexts that were present in their community.

b) Empowered to take ownership and responsibility

Primary participants felt that they could take more ownership and responsibility for their lives. In cases where blame had been placed on the role that domineering religion had had in eroding their culture, traditions, and identity, participants exhibited a willingness to assume responsibility for their own actions that could have a significant influence on their future.

Yeah, so. Because you can't really bring much of it [cultural practices] in right now. Like say if you wanted to smudge, you can't really bring that in right now. But I can see this community is changing right now, especially with the new council being in, like, there are certain things that are starting to change (Participant D).

It was clear that the perception about the impact of religion on the culture did not translate to hatred for the church, its practices or against elders who were religious. Participants appeared to maintain both their cultural identity along side their religious beliefs without one overpowering the other. They felt they were still able to own their identity and to take responsibility for relating with religious members of their community. For instance, one participant described her relationship with her grandfather as follows

That's one thing I talked to my elder about and, you know, we always talk about [...] losing touch. [...] I still try to go to church whenever I can. I like my grandfather's church. I try to go with him when he goes. I was also encouraged from one of my traditional elders to go to church and still practice native ways, you know (Participant M).

As participants cognitively moved from one cultural learning space to another, they also learned to take ownership and responsibility for their work. Those who were teachers reported that they took control of their classrooms, of the learning structures and of planning activities and programs. They seemed to approach their class differently than they had in the past. For instance, this participant described the following

Well when I was in Thompson ...I was barely in a classroom except for my first practicum, right. So when I went to do that teacher/student mentor [program], I learned a lot, like what kind of different types of students you will have and how to get your routine set up each day where you can control your class a little better. And the way ...he set up his yearly plan compared to last year's plan, and how he improves it each year as he goes along (Participant D).

This participant could recall his experience of taking ownership and full responsibility for his class after reflecting on his practice. Arguably, this sort of ownership and control may not have occurred as a direct result from the study. But by reflecting on his learning during the study, the participant was able to highlight the impact that Indigenous culture-based approach has had on his classroom structure. It allowed the participant to willingly explore the affordances of digital technology in his future classroom practice. For instance, he described how he intended to more carefully play an oversight role relating to specific strategies for using technology in the classroom, "I just want to comment on every single [post, on] what everybody's posting and tell them how to use a hash tag" (Participant D). He wanted to tell them how to correctly use certain features of the digital technology.

As participants assumed responsibility they seemed to move away from taking sporadic actions on digital technology such as posting erratic comments on social media to more responsible uses. The focus on the positive affordances of the technology seemed to deemphasize its other negative unintended consequences allowing participants to rather shift to outcomes that tended to produce benefits for them, their classrooms and their community. As they utilized their mobile devices to record videos and audios of family members and to leverage existing digital artifacts to describe their connections to family members, they were able to learn more about their

culture and to unearth hidden knowledge and content that would otherwise remain concealed.

During an exercise in which participants were to interview family members, record the interviews using their mobile devices and then create a digital genealogical family tree artifact, a participant reflected on this activity as follows:

Yeah. But when we started this family tree...I learned a lot of stuff. I mean, I learned a lot [about] family members...I was talking with my granny and we ...were talking about family trees and she started mentioning the names of my late grandfather's brothers and sisters. Well she started naming family, my grandfather's uncles because they used to go out on the trap line together. [...] Well first of all it [family tree] really helped [...], especially connecting with your relations in the community, you know your family, just even half of the family I didn't know before. [...] It's just the ones like further down the family tree, yeah. [...] Like my grandpa's sisters and brothers, I didn't know (Participant T).

Another participant seemed to have experienced a cognitive movement that increased his sense of responsibility beyond himself towards others. It allowed the participant to recognize his individual positionality, to utilize the lessons she had learned from her work as a teacher and to internally motivate herself in order to benefit others, such as to point them in the "right" direction:

Because one time I didn't take care of myself and I got very, very sick. It was a wreck. I was a wreck. And you know...I just felt so drained. I really did. I felt lost. You know I continued praying about it. You know... our young people... We gotta look at that too. You know they're seeking for help. They're posting things about being depressed and people are not taking that seriously. Because you know it's hard being depressed. You know when I was 29 years old I fell into a depression and it's hard. And that's what we

gotta understand too for our young people because a lot of them seem so lost and again we don't know what they're going through. And its good for them ...to gain that trust so they will talk, talk more about it. And we gotta do things in the community to keep them busy and occupied. [...] I've been working hard. Like for every course that I take. You know every course and when I look at my transcript I see the marks and say, "oh I deserved it because I worked hard for it". I would never say, "oh I didn't deserve this mark". I know I do because I always worked hard. And you know I kinda felt bad this weekend because I never miss school, I don't, never do. I'll be sitting there sick [in class], if I have to (Participant O).

Participants who were educators and who were in a position to help other young learners and community people had resolved to using Indigenous culture-based pedagogical approaches inside and outside their classrooms. Participants recognized the link between their language and culture and how these are consequently linked to their history. Participants assumed the responsibility to teach lessons about these linkages to the youth in the community

Yeah. Mostly snaring, yeah...The [kids] learned lots...Well a lot of them knew the basics. I guess their brothers or sisters took them out trapping. Right now I'm snaring, so. [I teach them to] respect the animals out there, respecting the animals they're trying to get. Not play around, play around with them and stuff like that...Mostly respecting the environment around them...I took out, I think six [kids]... in the morning, then six in the afternoon...Next day it would be another group and another group...I was doing my practicum, so ... I got to fit it into my plan, my daily plan...I'm still taking them out net fishing [... teaching them] just how to survive...Teaching them when the fish swim by ...or stuff like that. Like its changes in the seasons. The [children] did learn [it], most of

them did yeah. I took four groups of students...Grades 9 to 12. I had to go 9, 10 – I did it all mixed up. Yeah...Well, they learned those [fishes] have different names for them. Going there and they learn the names, all in Cree...Just because ...a lot of children are losing their language...It's very important for us to teach them, you know, our language so they won't forget. They might not learn all of it, just bits and pieces. Yeah. [It's important that they learn their language...It's their [...] culture, [the] way it's been – it's been used for [years]. When I was growing up, I used to live with my grandparents and they would always talk Cree with me. So I had to talk Cree to them, they didn't understand that much English (Participant T).

Another participant summed up these strong feelings of responsibility and ownership in his own practice. He also decided that he would challenge the status quo by respectfully introducing Indigenous concepts such as a sharing cycle into his classroom without disrupting his the curriculum and program structure. He assertively said, “So at the end of each day we have that sharing circle going on” (Participant D).

As participants became more responsible for themselves, for their learning and for others they also became more aware of their learning ecosystem and the role that they play in this system.

c) Significant understanding of the expanded ecosystem of learning and their connections to community, culture and politics

Participants exhibited knowledge of existing policies and the politics of education that was at play in their community. They were also able to identify the different stakeholders and the roles they played in their learning. They described the interrelatedness of learning to the standard of living in the community. They also described the policies that affected this interrelatedness. They

demonstrated knowledge of the economic and social aspects of their ecosystem and its connection with their learning context. One participant described this connection as follows

Even living in our community is expensive. When people shop in the community their groceries come out to like \$400 you know, even my family and I, we spend a lot of money even though we only have two kids. Imagine the people that have more than that. And you know um, you can't say to them, "oh get a job", or things like that because there's rarely jobs in the community. You know it's not our fault that a lot of people have to go through welfare, the welfare system too. You know I think that too, like, the government did that on purpose. You know the welfare trap and "all these Aboriginal people depending on welfare, that depend on welfare" and you know, like, we don't have much of a choice. And that's why it's important too to know the land that they must fish, hunt, trap, to have those skills. Because it's, it's there, it's there. It's all around us (Participant O).

Participants expressed knowledge of their community and a much more elaborated sense of learning about relations. Strong familial relationships are a cornerstone of Indigenous culture, which is elaborated through established knowledge of closeness with immediate, and extended family members. As participants became more aware of gaps in the relationship with family members as a result of the unintended consequences of digital technology, they decided to take conscious steps to narrow these gaps:

And you know just teaching them [students in their class] about the culture, the history of their people, to be proud of whom they are, and...because Aboriginal people was once a strong nation. All these people that work together, you know and they were so connected in many ways. They helped each other survive, survive, they survived. [...] And you know

they had to move around to follow like the fish, the animals, and that's one thing too we have to look at because a lot of people don't really help each other now (Participant O).

These social, cultural and community connections were established through stories, legends and myths which they had been told and which they have now reworked into their own stories. These stories were being passed from one generation to the next. They reflected on the connection of cultural elements such as their language, land, stories, etc. to learning and growth

A lot of alcohol, drugs, things that you didn't see like 15 years ago, 20 years ago. And you know it's changing so quickly. And that's what I want to teach my students, the history of our people, the stories, the legends and to feel good about whom they are. And to be proud of whom they are. You know and the language too. I'm proud to be very fluent in Cree.

Very fluent. And my children too, especially my son, he's a very good Cree speaker. [...]

You know...they would say, "you should speak English to your child because they think, what I think". It is that they think that their children will be more educated if they would just speak only one language, which is English. But I don't think that's true. Because I think the more languages that you know, the more intelligent your mind will be. And that's what I see in my son. And it's never a dull moment with my son, especially when he speaks Cree; things are funnier in Cree. And when he shares these kinds of things, you know his stories or when he comes home from school, they just laugh 'cause he's very hilarious and you know...my son, he's always out hunting with his dad. No matter how cold it is, he will still want to go and you know I'm proud of that. I'm proud to say that my son is learning his culture and he knows his language and I want him to know the land and the places, you know I would ask him when we're on the boat 'what is this place?' Then he

would know and he knows more than I know. And I'm proud of that, I'm very proud of that (Participant O).

Participants seemed to experience a cognitive movement that seemed to be similar to the notion of Ubuntu described earlier in chapter 1. This notion suggests that a person does not exist in isolation but that he or she consist in the humanity of others and the connections that they all establish between themselves. This notion is also similar to the “Seven Sacred Teachings of the *Anishinaabe* people”. Participants expressed respect and responsibility by establishing connections with others. They quantified these relationships as having more value than monetary gain. This was probably part of their culture and far less likely that it resulted as an output of this study. However, it was worth highlighting as a valid reflection resulting from reasoning associated with the study.

You know what I was proud of, is that I was able to do something for the elders in my community and you know they were trying to pay me that time and I didn't take the money. It wasn't about the money because that came from the heart (Participant O).

Another important thematic aspect that emerged from the study concerned the concept of failure, which was mentioned earlier as possibly a Eurocentric concept entrenched during the residential school era and which has had a lingering effect on learners in the study community.

d) The notion of failure in Indigenous context

Numerous studies of academic success often challenge students, administrators and educators to assume more responsibility for their learning and to prevent decline into failure (Cheruvath, 2012; Dante et al., 2016; Lucio, Hunt, & Bornovalova, 2012). Many of these studies often characterized “failure” from a perspective of not meeting pre-defined standards such as a grade point average or a particular academic score. Toulouse (2013), an Indigenous author of

“Beyond Shadow” on the other hand, explores the same issues albeit from a “success” perspective. In fact, there is not a single mention of the word failure in her entire text.

It may seem that the notion of failure may not have been present in Indigenous learning ontology prior to the residential school system. It may have been introduced when learning Eurocentric learning methods were used as a systematic tool for eradicating Indigenous identity and culture. As a result, this notion of success may have been placed side-by-side with this concept of failure.

Success is entrenched in Indigenous culture as persistence; the ability to try several times until the desired outcome is attained. Exemplars of success in Indigenous context could be an elder telling a youth to reset the trap several times over until it has ensnared its prey, to continue to move until the destination was reached during hunting or trapping, to tell the same stories over and over again, ever so slightly varied, until the right lesson was learned and Indigenous-based cultural cognition has been attained.

This notion of failure appears to be powerful; so powerful that Indigenous notions associated with repeated trials until success is attained, pales in comparison to it. It may have prevented students from trying to succeed. This student described failure in this form

[...] you know, [being] afraid to fail. Just things like that. But I learned that even if you fail you can do it again and just keep on going. You know because I think that's one thing I was always afraid of. I even shared that with my husband...I said, I think that's why a lot of people don't want to go to school. They don't want to keep going further in their education because I think a lot of us are afraid to fail. We don't want people seeing us fail. And you know as I thought about it more and more it's like it's ok. Like sometimes people take the same course three times until they're able, you know, to pass that course. And I

always tell my kids that too. If you don't get it the first time just try again. Even if you try five, ten times it doesn't matter. But you'll get there. And you know um, I've been working hard in this program. Every time there is a test coming up, an exam, I would just study, study, study during my lunch break. Like I would go home, and I would just open up my books like right away. And you know like my kitchen was always a mess, just papers everywhere all the time. But now you know and as I went on it got easier, you know, because you understand more and you know what you're talking about (Participant O).

This notion of failure, because of its inherent alien nature, seemed to frighten this participant. Further study may be required to explore this subject and its inherent impact on the Indigenous learner. This could likely reveal this perception of failure as a factor that contributes to the high attrition among Indigenous learners. Addressing the challenge posed by this perception from a pedagogical approach might potentially transform failure rates among Indigenous learners in the post-secondary sector. It appears that learners would rather fail and drop out of the educational system than be labeled a “failure”. Such label may be alien to Indigenous cultural identity.

Those participants that may have developed a strong sense of identity and knowledge of their learning ecosystem tended to exhibit strong personal determination and self-motivation to challenge this notion of failure. I recalled during an interview with this participant that she had been completely demotivated a few times during the period of the study, one of which had occurred during the week there were two funerals in the community. Even when there were no incentives to participate in the study, she made great effort to continue. She recalled that

When I first started this I was really into it but along the way something happened to me and it stopped me but then there was always people around to encourage and [name

withheld] would encourage me. She wouldn't leave me alone and I got back into it. That happened to me twice - and [I'd] just continue going to school. Things will happen along the way but you can't give up (Participant E).

This notion of failure and its relationship to Indigenous education and culture is an interesting concept that requires further research.

5.5 Further Research Questions

This study was about identifying the determinants that assist post-secondary Indigenous learners in an isolated community to adapt and orient themselves between Eurocentric and Indigenous ways of learning. Digital technology was used to produce documentation. A framework has been presented from analyzing the research data. Four themes emerged and a number of significant determinants which practitioners should consider for learners in a similar context. Future research may be required to test and refine the Techno-Culture Adaptive Framework. Practitioner action research may produce outcomes that could benefit it. In the meantime, it can be used to examine the phenomenon of learning with technology in contexts where multiple worldviews are present.

Because contexts are different and nuanced and because the application of technology, mobile or otherwise, may produce different outcomes researchers might want to seek answers to fundamental questions such as what worldviews do learners straddle, what types of connects and disconnects are present in learners' learning environment, what socio-cultural challenges confront learners who use digital technology, what are the possible unintended consequences and affordances of using digital technology in the learning context?

Future researchers may be interested in developing a more appropriate framework for assessing cognitive movements when technology is used. They may also be interested in

exploring the suitable methods for assessing cognitive movements from one cultural learning domain to another.

The study has identified a number of determinants necessary for learning in a cultural context where multiple worldviews are present. These are by no means a complete list of determinants. More research may be required to identify other important factors that should be present in contexts where learning is challenging and where more positive learning outcomes are desired. The study focused on learning with less emphasis on teaching as the flip side of the pedagogical coin because primary participants were mainly students in teacher education who provided input from the learning side. For learning gains to be attained, commensurate teaching strategies that respond to the issues raised by learners in this study may be required. In fact, an environment conducive for learning is one that is mutually developed by all education stakeholders. While both the educator and the learner will have to take responsibility for learning, others such as the school administrators, community members, administrators, and community leaders such as elders, are equally responsible for creating the right environment, the appropriate platforms for dialogue, and the right educational spaces required for students to learn and succeed. The outcomes of this research therefore should apply to these different stakeholders also. Further research may be required to address the direct and indirect roles that they would need to play to facilitate learning in Indigenous communities.

The potential impacts of the project may also vary within communities. In this study, a renewed sense of identity, empowerment and engagement in the policies and politics of the community emerged as direct impacts for participants in the study. These outcomes may be different from one community to another. Therefore researchers should focus on identifying the

specific impacts that could emerge when the Techno-Culture Adaptive Framework is applied to their specific research context.

For the learners in this study, the vision of an empowered student whose identity is renewed and who has a better understanding of his or her learning context, should drive their use of digital technology for learning. It is this vision of an empowered student that may likely produce positive affordances of digital technology use and that may mitigate the likely impact of negative unintended consequences. Even when digital technology has not been specifically included or permitted in their pedagogical plan, students should be willing to ask educators how they may be able to explore the affordances of digital technology in their learning. They should be willing to ask how they may be able to explore its role for facilitating learning across multiple cultural domains.

Further research is required for questions that emerged that were specific to Bunibonibee Cree Nation. For instance, how could digital technology be used to minimize the impact of trauma, cyberbullying and cultural separation in the community? How could digital technology be used to create stronger ties between community members, their community and culture?

5.6 Summary

Primary participants of this study demonstrated some negotiations between multiple worldviews that were present in their learning context. By understanding these negotiations educators and others involved in teaching and learning in similar contexts may be able to facilitate similar negotiations for their students. They may be able to apply the lessons learned from examining the negotiations to address potential issues such as low attrition and poor completion rates of adult learners in their learning contexts. The main research question concerned the identification of the determinants for these negotiations in relation with the use of digital

technology for learning in an Indigenous community in northern Manitoba. Cognitive movement was described in relation to how students framed Eurocentric and Indigenous worldviews and how they were able to reduce learning cues from one context to the other. Movement was also demonstrated when participants were willing to construct bridges and to use their Indigenous learning context as a scaffold and base on which to construct towards a Eurocentric learning context. Cognitive movement was observed as an indirect measure of the learners' awareness of their Indigenous positionality in relation to the other.

The study data was analyzed using the Digital Technology Mediated Adaptive Orienteering Framework as a conceptual framework that was developed from Atleo's (2001) metaphorical mapping framework, Bertram, Moskaliuk & Cress's (2015) framework for the evaluation of virtual training, and Edward and Hardman's (1989) concept of lostness in the virtual world. The *Techno-Culture Adaptive Framework* was produced as a result of analyzing the research data. It contains four themes and several determinants. It is presented here as a useful framework for educators who may want to facilitate student learning in contexts that are similar to those of the study.

The study identified four major themes which responded to the overarching research question. By examining the themes further, determinants specific to this research context emerged. The first theme concerned the "connects" and "disconnects" between the community members and digital technology, learning and their culture. To address disconnects, suitable and appropriate digital technology may be required so that learners in the community may be able to have access to information and knowledge sources. Such technology should also positively respond to the community's culture. It should not erase valuable cultural attributes but rather enhance it. They may also be able to create content. The learning community may need to develop

its own local expertise, someone who could negotiate infrastructure policy and technical issues on their behalf and who would manage a community wide platform for dialogue.

The second theme related to the socio-cultural challenges of learning in the community. The presence of a safe frame was essential for learning with digital technology. The frame is made up of policies, protocols, rules, norms and ethics of conducting research in the Indigenous community. It also guarantees the protocols for learning transactions that should be present in the learning community. These learning transactions between the learner and the educator should ensure the privacy of the learners, equitability between the learners' Indigenous cultures and any other culture(s) present in their learning context and it should ensure safe communication. Within this frame are the learners, educators, community members and policy makers involved in the learning process. A safe frame is a critical requirement for conducting research and for facilitating learning in an Indigenous setting. The presence of a safe frame should help address issues such as trauma, which had had a significant impact on learners in the study community. Learners in Indigenous communities might likely take more positive steps towards achieving learning goals if their cultural context is recognized as the base from which other cultural learning contexts can be scaffolded. They might also likely succeed if they could challenge negative colonial strategies.

The third theme related to the unintended consequences resulting from the implementation of digital technology for learning in the study community. Digital technology produced unintended consequences for learners. It is important that learners have a mindset that undesirable consequences may likely emerge from the use of digital technology. With such mindset, participants are likely to identify them quickly when they emerge and to identify strategies to mitigate negative impacts.

The fourth theme relates to the various affordances of digital technology for learning in the community. Technology that would be useful for learners should help them establish connections with their culture and it should allow learner to enhance and transform their existing cultural practices. Learners should be able to explore digital technology's entertainment value. By extending this value to their learning context, they might be able to "feel good", entertained and to have more confidence about their learning. These outcomes might make them pursue learning for the relevance (Atleo, 2001) and "feel good" feeling until learning goals are attained. It might allow them to explore new affordances of digital technology and to discover new uses of digital technology in ways that help them to attain more gains.

5.7 Concluding Thoughts

In addition to identifying the determinants at play in the study community this study produced a framework (Charmaz & Smith, 2003; Strauss & Corbin, 1994) that could help educators appropriately implement digital technology for student-learning in Indigenous learning domains. These themes and determinants could be posed as questions to help educators critically examine pedagogical applications of digital technology in their specific learning context. Participants in these domains may be expected to demonstrate knowledge of, and competency based on standards developed in Eurocentric learning domains. Students may be required to succeed by developing the competencies needed to move back and forth between the learning domains present in their learning environment. Through consistent back and forth movements, fluency of movements could occur. Fluency could produce gains that allow learners to interact with Eurocentric forms of learning delivered in an Indigenous context. It might help them to address educational challenges in their communities such as high attrition and low post-secondary

completion rates. However, all of these should be done in a safe frame, because a safe frame would encourage such fluency of movements.

It should be clear however, that the use of digital technology or any internet technology for learning is not a single-sided endeavor that is left only to the learner. Even though the learner may have some degree of control in digital technology's use outside the classroom such as at home or selectively at school, recognizing that the level of the learner's control is comparatively lower than those of his or her educator is important. Such recognition could help educators to best identify digital technology's pedagogical utility in the learning context and to determine its affordance outside and inside the classroom.

While this study has focused mostly on reflections from the "learners'" perspective, more gain can be attained by recognizing that the "teachers" perspective is equally important for attaining sound pedagogy that is responsive to Indigenous ways of learning. Teaching and learning are complementary. Careful pedagogical design and application of digital technology in the classroom is equally important to produce outcomes that provide learning gains to the learner. Here, the educator, school administrator and others who influence education should determine digital technology's utility and decide to what extent it should be used. For instance, an educator could determine if community-based research through fieldwork outside the classroom should be conducted using digital technology or if it should be conducted by using pen and paper in a classroom. Developing strategies that utilize outcomes from both these perspectives is likely to influence the learners' learning experience.

The study argues that learners are likely to succeed if learning starts by first recognizing and then understanding their Indigenous learning domain; and then building the necessary bridges

and scaffolds from this Indigenous learning domain to another learning domain that may be present in their learning context.

There is utility in the idea that recognizes the learner's Indigenous culture as the base domain for their learning and from which the necessary bridges and scaffolds to other cultural learning domains can be built. In the Canadian Indigenous context, outcomes of this study could form the basis for identifying solutions to educational challenges of high attrition and low participation rates amongst Indigenous learners who may be required to succeed in a Eurocentric learning context. Sustainable impact could resemble Indigenous students progressing through one level of education to another, transitioning from elementary to secondary and onward to post-secondary. This sort of outcome could result in reduction of attrition rates and for promoting inclusive learning that leads to long-term economic impacts. For Indigenous learners, it could "look like" equitable employment and stronger socio-economic standing. For Canada, it could resemble an equitable society in which all citizens are given opportunity to succeed and in which the country competes in the global economy with more qualified human resource.

The method, methodology and the emergent Techno-culture Adaptive Framework of this study could be useful for asking the right questions that assist in identifying the critical factors that are needed for Indigenous learners in remote communities to succeed. Framed as determinants, a set of factors has been identified that educators may consider in facilitating learning for learners in Indigenous communities similar to the one in which the study was conducted.

With the preponderance of digital technology in Indigenous communities, examining its utility for learning could have potential impact on our collective Canadian future. If attrition is reduced and completion rates are improved amongst Indigenous post secondary learners, the funds

applied to these initiatives could be redirected to other social programs. Programs that focus on improving health delivery in Indigenous communities through tele-medicine or programs that focus on improving access to good quality agricultural produce could result in more health gains for various Indigenous communities and consequently for the country. The presence of large bandwidth infrastructure could attract investments in research and development for technology that is responsive to northern climatic conditions. These outcomes are consistent with the social determinants of health.

While these outcomes may seem utopian, there is likelihood that careful and thoughtful pedagogical strategies that recognize and embrace them could produce far-reaching benefits for Indigenous communities and the country. We may need to rethink every course, lesson, curriculum, education strategy, school structure and learning philosophy, all from an Indigenous perspective.

The effect of technology such as the internet, social media and mobile phones has produced tremendous growth in the past two decades, globally and in Canada (Akoh, 2012b; Diamond & Roberts, 2012; IndustryCanada, 2014; WEF, 2012). Proportions of national gross domestic products (GDP) are linked to contributions from the information and communications technology sector. For instance, in 2014 this sector contributed \$70.2 billion to Canada's national GDP, accounting for 4.3%, and 3.1% of national employment numbers (IndustryCanada, 2014). The internet and digital technology, which are a basis for this growth also form the bedrock of recent innovative solutions especially in the health sector, governance, entertainment, financial services and even in politics. Education has benefited from this too because the internet, especially digital technology, is used for teaching and learning. Books, academic journals and articles can be accessed online. So can videos, instructions, learning management systems, and

other interactive platforms needed for instruction, collaboration and learning. There is benefit in the appropriate use of internet and digital technology for education. Their application could have strong impacts on social and economic aspects of society. These applications are sometimes determined by government policy.

Policy decisions are more likely driven from an economic perspective, so that policies that concern social, cultural or environmental impacts including policies on education, especially those that impact Indigenous people, are likely to fall second or far below the priority scale of government's programs (GC, 2016). This study argues that considerations for technology implementation for Canadians should include much more than economic considerations. Findings from reviewing the CRTC's "obligation to serve" provision and comments from secondary participants in this study indicated that economic incentives and the potential for a return on investment decide whether or not digital technology infrastructure will be deployed to any part of Canada. These decisions also affect Indigenous communities, particularly their economic, social and cultural wellbeing. Even though the current federal government administration is focused on Indigenous issues, there is a need for a more holistic dialogue that brings various aspects of development and growth, i.e. telecommunication, learning in Indigenous context, health, infrastructure and food to the table for further discussion and action. Examining learning in Indigenous contexts, from an Indigenous perspective and exploring the utility of digital technology in this space, as captured in this study, is a small but significant contribution to this holistic dialogue.

These elements are represented in the model framework which this study has produced and which should catalyze this type of dialogue. This study has hopefully opened the doors for further exploration on the impacts of digital technology on Indigenous cultures that have been existent for

centuries. This study has also shown how technology can help to narrow the gap between strong Indigenous cultural ways of learning in which Indigenous learners are versed and Eurocentric ways of learning in which they have been asked to succeed.

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