University of Alberta

Integrating an Aboriginal Perspective: Issues and Challenges Faced by Non-Aboriginal Biology Teachers

by

Tracy Lynn Blood

A thesis submitted to the Faculty of Graduate Studies and Research
in partial fulfillment of the requirements for the degree of

Master of Education

Secondary Education

Fall 2010
Edmonton, Alberta

Examining Committee

Susan Barker, Secondary Education

Norma Nocente, Secondary Education

Jerine Pegg, Elementary Education

Abstract

This exploratory case study investigated the ways non-Aboriginal teachers of Biology conceive of incorporating Aboriginal perspectives into their delivery of the Biology curriculum in Alberta. The participants in this study were non-Aboriginal Biology teachers teaching in schools with predominantly non-Aboriginal students. Semi-structured interviews were conducted with each of the teacher participants and explored issues and challenges that they face infusing Aboriginal contexts into their teaching. The qualitative data generated were coded using themes developed from a conceptual framework for curriculum implementation. The majority of the teachers saw value in incorporating Aboriginal perspectives but shared concerns due to: unclear definitions of Aboriginal and Aboriginal perspectives; an inadequate knowledge base; and lack of material resources and professional development opportunities. Recommendations to help non-Aboriginal teachers include: better access to and targeted professional development and resources; greater clarification on the definitions of Aboriginal and Aboriginal perspectives; and greater amounts of administrative and governmental support.

Acknowledgments

I would first like to thank all of the teachers who participated in this study. Their interest in this project was incredibly inspiring and they have motivated me to continue trying to incorporate Aboriginal perspectives in my classes, despite the difficulty.

I am deeply indebted to my supervisor, Dr. Susan Barker for all of her guidance and support. I cannot imagine how I would have completed this without her and am constantly inspired by her drive and determination. Thank you as well to Dr. Norma Nocente and Dr. Jerine Pegg for agreeing to be on my examining committee. I appreciate your time and consideration to this project and myself.

Finally, thank you to Scott for being my biggest champion, even when I doubted myself. You constantly believed in me and never made me feel guilty about spending so much time working. More importantly, you made me believe in myself and I will never forget that.

Table of Contents

List of Tables

List of Figures

Chapter One

Introduction

1.1 Problem Statement

The Biology 20-30 Program of Studies (Alberta Education, 2007) has mandated the implementation of Aboriginal perspectives throughout the curriculum as a way for students to develop an appreciation of the contributions Aboriginal peoples have made to science and technology. The incorporation of Aboriginal perspectives has been mandated through its inclusion in programs of study, which are legal documents for teachers outlining what students are expected to learn. Implementation in other curricula in Alberta and curricula in other jurisdictions have yielded success, particularly with Aboriginal students, however, teachers have expressed difficulties with this implementation (Aikenhead, 1997; Aikenhead & Huntley, 1999; Coalition for the Advancement of Aboriginal Studies, 2002; den Heyer, 2009; Kanu, 2005; Taylor, 1995). This research examines how Alberta teachers of Biology conceive of incorporating Aboriginal perspectives into their delivery of the Biology curriculum, specifically in their classes of predominantly non-Aboriginal students.

1.2 Research Purpose

This research has developed from my own personal experience. As a non-Aboriginal teacher of Biology in Alberta I have struggled with how to incorporate a perspective that is entirely foreign to me. Aikenhead (1997) suggests that for Aboriginal students, Western science may be a foreign culture that requires the

student to cross a cultural border crossing. If teachers do not help their Aboriginal students to cross this cultural border, the students are likely to experience tension and be unsuccessful (Aikenhead, 2006). As a non-Aboriginal teacher, I also experience Aboriginal perspectives as an unfamiliar culture and am looking for resources to help me cross this cultural border. The purpose of this research is to understand the successes and the barriers Biology teachers have in incorporating Aboriginal perspectives and to identify professional development opportunities and resources that teachers would find valuable in attempting to incorporate unfamiliar perspectives.

1.3 Research Questions

> The main question emerging from my own personal experience is:
>
> How do non-Aboriginal teachers of Biology, conceive of incorporating Aboriginal perspectives into their teaching of the Alberta Biology curriculum?

The focus of this study is to investigate how teachers conceive of implementation of Aboriginal perspectives, which is essentially a curricular implementation. Teacher factors, including the value they place on a particular curricular innovation will influence the successful implementation of the curricular innovation (Rogan & Aldous, 2005). Fullan (2007) contends, "educational change depends on what teachers do and think" (p. 129). Given the importance of the actions and thoughts of teachers, subsidiary questions used to guide the main question are:

I. How do teachers incorporate Aboriginal perspectives in their teaching?

II. What value do teachers see in incorporating Aboriginal perspectives?

III. What supports do teachers utilize or have access to and what resources would teachers like access to while preparing lessons which incorporate Aboriginal perspectives?

1.4 Definitions

1.4.1 Science

Alberta Education (2007) define "the goal of science is knowledge about the natural world" (p. 8). Western science has been described by Nadasdy (1999) as being "quantitative, analytical, reductionist, and literate" (p. 2), while Berkes (1999) characterizes science as disembedded, universal, individual and holding the view that nature is a commodity. Aikenhead (2006) suggests the definition of science differs depending upon cultural perspective. When Aikenhead and Huntley (1999) interviewed Aboriginal and non-Aboriginal teachers of grades 7-12 science, none of them attempted to define science. These teachers represented a wide range of experience, background education and teaching situation, including band operated schools, urban schools and rural schools. Several different meanings of science emerged depending upon the context: (1) any knowledge about nature; (2) canonical knowledge, skills and values; (3) school subject; (4) processes and products that are usually associated with technology; and (5) a part of Western culture or subculture (Aikenhead & Huntley, 1999, p. 164). For the purposes of this study these meanings of science from Aikenhead

and Huntley will be used as these meanings were derived from teachers. In addition, these five different items represent a wide range of meaning and are encompassed by the definition of science by Alberta Education. While definitions of science are important, because this study is grounded in the Biology curriculum, the objectives teachers are expected to teach are outlined in the program of study (Alberta Education, 2007) and a large discussion regarding definitions of science are beyond the scope of this investigation.

1.4.2 Aboriginal

Alberta Education (2005a) defines Aboriginal as "the descendants of the original inhabitants of North America. The Canadian Constitution [Canadian Charter of Rights and Freedoms, 1982] recognizes three groups of Aboriginal peoples: First Nations, Métis, and Inuit" (p. v). For the purposes of this investigation, this definition provided by Alberta Education will be used as the curricular implementation of Aboriginal perspectives is connected to this definition. An Aboriginal perspective is thus based on the distinct worldview of Aboriginal groups. This worldview is "the way a group perceives and understands the world" (Alberta Education, 2005a, p. 10). In some instances other words such as Native or indigenous, may be used in this paper to reflect the changing terms used by researchers based on time or location (for example in Australia or the United States).

1.4.3 Traditional Knowledge Versus Aboriginal Knowledge

There has been much discussion of the term traditional knowledge in the literature. While traditional knowledge is sometimes used interchangeably with

Aboriginal knowledge, Berkes (1999) argues that traditional knowledge is a subset of indigenous or Aboriginal knowledge. Tradition refers to "cultural continuity transmitted in the form of social attitudes, beliefs, principles, and conventions of behavior and practice derived from historical experience" (Berkes, 1999, p. 5). Traditional knowledge, therefore, implies enduring understandings and change is somewhat of a contradictory term. Non-Aboriginal people may hold traditional knowledge. For example, cod fisherman in the Atlantic hold traditional knowledge regarding the best places to catch fish, but they do not hold Aboriginal knowledge, as their knowledge is not grounded in Aboriginal culture (Berkes, 1999). Aboriginal knowledge, on the other hand is knowledge that combines a traditional perspective with current context and change becomes part of this knowledge. Aboriginal knowledge may be defined as local knowledge held by Aboriginal people or knowledge which is unique to a particular Aboriginal culture (Berkes, 1999).

1.5 Significance of the Study

This study is significant in three ways. First, this study begins to explore the ways in which non-Aboriginal teachers identify how they are incorporating Aboriginal perspectives. Investigating the ways in which teachers feel they are incorporating Aboriginal perspectives is important for policy makers to determine whether the definition of Aboriginal perspectives in the program of study is clear. Secondly, if teachers are incorporating Aboriginal perspectives in vastly different ways from each other or how Alberta Education has envisioned, then perhaps the

development of resources and professional development opportunities needs to be undertaken. In addition, finding out the types of resources teachers currently have access to, those they wish were available and other needs as identified by teachers, could provide insight for policy makers regarding the development of such resources.

Finally, teachers take new curriculum proposals, interpret, categorize and select which curricular innovations they will take on and which they will not (Pinto, 2005). Investigating the value teachers see in incorporating Aboriginal perspectives may provide insight into the extent to which teachers are taking on this new curricular innovation. More generally, this study is significant because Aboriginal knowledge and science are often seen as discourses in which there is no commonality (Berkes, 1999). Studies which contribute to the body of knowledge showing how these two perspectives may be integrated is likely to increase the achievement of all students who see Western science or Aboriginal knowledge as foreign cultures.

Chapter 2

Literature Review

The purpose of this literature review is to critically examine the work in the field of Aboriginal perspectives integration. In order to accomplish this, how Aboriginal perspectives have been included in Alberta science programs of study will also be discussed. Following this, the pivotal role that teachers' play in the implementation of new curricula and the framework used to investigate this issue will be outlined.

Difficulties might exist when attempting to incorporate an Aboriginal perspective into science curricula due to differing Aboriginal worldviews and scientific worldviews. Western science is seen as a subculture of Western society, and this may contribute to the tensions that exist between Aboriginal knowledge and scientific knowledge. These tensions have important implications for the learning and teaching of science and Aboriginal perspectives. The difficulties and successes teachers have had in incorporating an Aboriginal perspective, followed by the views teachers have had regarding this incorporation will be discussed.

As this study focuses on teachers' views, the literature regarding student responses for the most part has been omitted, as it is not within the scope of this investigation. Each section of the literature review provides a background and context for the current study, identifies gaps in the current literature and shows how the research questions have evolved.

2.1 Inclusion of Aboriginal Perspectives in the Alberta Curriculum

The incorporation of Aboriginal perspectives has been included in the Alberta Biology 20-30 Program of Study (Alberta Education, 2007), as well as in all Alberta programs of study. The rationale for implementing Aboriginal perspectives in the Alberta science curricula is "to develop, in all students, an appreciation of the cultural diversity and achievements of First Nations, Métis, and Inuit (FNMI) peoples" (Alberta Education, 2007, p. 2). To do this, science programs of study have been designed to "acknowledge the contributions of Aboriginal peoples to understandings of the natural world" (Alberta Education, 2007, p. 2), to demonstrate humankind's interconnectedness to the environment, to integrate learning from different scientific disciplines, and to improve the success of all learners in the classroom (Alberta Education, 2007).

In order to achieve given curricular outcomes, examples are provided in italics in the program of study, which do not form part of the required program but do suggest how these outcomes might be addressed. The required portion of the Alberta Biology 20-30 Program of Study includes, themes, overviews, links to mathematics, focusing questions, general outcomes and specific outcomes (Alberta Education, 2007) and states that science courses in Alberta incorporate Aboriginal perspectives. While the Alberta Biology 20-30 Program of Study does not directly include objectives related to Aboriginal perspectives in the required portion of the program, italicized examples are provided as a way of addressing the Aboriginal perspectives component of the program of study (Alberta Education, 2007). For example outcome 20-B1.2sts in the Biology 20 program of

studies states students will "explain how conventions of mathematics, nomenclature and notation provide a basis for organizing and communicating scientific theory, relationships and concepts" (Alberta Education, 2007, p. 28). A suggestion for how to address this objective is provided in italics and states students will "research plant and animal systems of classification developed by Aboriginal peoples in their cultural practices" (Alberta Education, 2007, p. 28). The italicized example addresses outcome 20-B1.2sts, while at the same time superficially acknowledging the Aboriginal perspectives component of the program of studies.

In addition to providing examples throughout the program of study, Alberta Education (2005a) has developed a resource entitled, *Our Words, Our Ways: Teaching First Nations, Métis and Inuit Learners*, with the goal of helping teachers to better understand the needs of their Aboriginal students. The purpose of the resource is to "offer information about Aboriginal cultures and perspectives, practical ideas, and sample strategies that will help teachers meet the needs and recognize the gifts of Aboriginal students" (Alberta Education, 2005a, p. v). Chapter three of this resource, *The Classroom: A community of learners*, provides suggestions for how teachers may infuse Aboriginal perspectives (Alberta Education, 2005a) including delineating that Aboriginal content is to be infused in an embedded, integral and ongoing part of the classroom experience and not simply as add-on material or participation in a special event.

Alberta Education (2005a) recommend that non-Aboriginal teachers can ensure that infusion of Aboriginal content is appropriate by relying on Aboriginal

resources such as, videos, print materials and contacts in the Aboriginal community. A list of Aboriginal Agencies and Organizations is provided as well as a discussion of how literature by Aboriginal authors may infuse Aboriginal perspectives in the classroom, however this information remains fairly general. In order to begin the process of infusing Aboriginal content, Alberta Education suggests using a holistic approach, observation, experiential learning, learning based in the community's resources and the consideration of multiple perspectives. One thing to point out is that this resource was developed to help teachers better understand their Aboriginal students. However, the infusion of Aboriginal perspectives has been mandated across curricula for all students.

How Alberta Education has included Aboriginal perspectives as part of the Alberta Biology 20-30 Program of Study (Alberta Education, 2007) and how Alberta Education has suggested a teacher might begin the process of Aboriginal perspective integration is important for this investigation as it provides a context for the perspectives that teachers are being asked to include in their classrooms. The incorporation of Aboriginal perspectives can be seen as a curriculum implementation, therefore the meaning of curriculum and the role that teachers play in curriculum implementation are pivotal to this investigation.

2.2 Teachers' Role in Curriculum Implementation

Curriculum can be defined of as being almost everything in the school, including the books, staff, extra-curricular activities and seating plan (Ledoux, 2006). However the most conventional meaning of curriculum usually "refers to

the planned curriculum that may be embodied in a course of study, a textbook series, a guide, a set of teacher plans, or an innovative program" (Snyder, Bolin and Zumwalt, 1992, p. 427). Alberta Education (n.d.) defines curriculum as being outlined in programs of study, which are legal documents summarizing what students are expected to learn and how they might learn. Alberta Education goes on to say that school authorities have the flexibility in deciding how best to meet these goals, which may include the planned portions of the curriculum that Snyder, et al (1992) allude to above. For the purposes of this study, the focus will be looking at this definition of the planned curriculum and not the hidden curriculum. The incorporation of Aboriginal perspectives is a curriculum innovation as the ways in which teachers deliver the curriculum are new, therefore curriculum innovation is used throughout to describe Aboriginal perspectives integration. The terms curriculum and curricular implementation will be used interchangeably with curriculum and curricular change as Aboriginal perspectives is something which is to be included in the program of study. However, Aboriginal perspectives integration also requires a change in perspective and possibly a change in the delivery of curriculum for many science teachers.

Milner (2005) proposes that what is included in the curriculum content, including the how and why, is important for students as they come to understand themselves in a multicultural society. Gay (2000) further suggests that "curriculum content should be chosen and delivered in ways that are directly meaningful to the students for whom it is intended" (p. 112) and that student learning improves when curriculum content is meaningful and relevant to the

students. Gay also contends that curriculum which is culturally diverse offers several benefits such as allowing students who may not have close contact with people from other ethnic or cultural groups the chance for communication and the ability to engage in confrontation with their own fears or myths surrounding diverse groups of people.

The incorporation of Aboriginal perspectives in the Alberta Biology curriculum may be seen as a curricular implementation. Curriculum which is to be implemented, implies something concrete or tangible which is to be carried out by teachers (Snyder, et al, 1992). Snyder, et al (1992) in a seminal work discuss the process of implementing a proposed curricular change by first discussing curriculum implementation from a historical perspective. They found that research into curriculum implementation was not a major focus until the seventies, and prior to this most research looked at assessment of planned outcomes. Researchers concluded that curricular innovations failed if they simply looked at assessment of planned outcomes. However, further analysis suggested these innovations did not fail, they were never implemented (Snyder, et al, 1992). This led to the development of curriculum implementation as a focus for research.

According to Snyder, et al. (1992), there are three different perspectives along a continuum when viewing curricular implementation. In the fidelity perspective "curriculum knowledge is primarily created outside the classroom by the experts who design and develop the curriculum innovation" (Snyder, et al., 1992, p. 404). In this model successful implementation occurs when the teacher enacts the curricular change correctly according to the person or agency

responsible for the development of the implementation. The second curricular implementation model mutual adaptation, is defined as a joint venture between curriculum developers and teachers (Snyder, et al., 1992). Adjustments are made to the curriculum by the curriculum developers and teachers together. Therefore, the teacher is shaping the curriculum and ultimately the direction of curricular changes. From the third curricular implementation model, "enactment perspective, curriculum is viewed as the educational experiences jointly created by student and teacher" (Snyder, et al., 1992, p. 418). The role of the teacher is thus integral in any curricular reform or change, as the teacher is directly involved in the development of the curriculum.

Although the role of the teacher differs in the three curriculum implementation models presented, the teacher remains an essential factor to successful implementation. In Alberta, curricular changes are developed in documents or programs of study, created by curriculum developers with input from practicing teachers. The involvement of teachers in this process differs across subject areas. Not all teachers are involved, so in this way, curricular change may be situated somewhere in between a fidelity perspective and mutual adaptation. Because teachers are so essential to successful implementation, their perspectives regarding the change in question are vital.

Following the seminal work of Snyder, et al., (1992), Fullan, Cuttress, and Kilcher (2005) echo the sentiment that most cases of curricular innovation do not fail, they are not implemented. This may be due to a lack of understanding of change knowledge, which is "understanding and insight about process of change

and the key drivers that make for successful change in practice" (Fullan, Cuttress, & Kilcher, 2005, p. 54). If teachers do not understand the change or the process, implementation is unlikely to occur. Fullan (2007) describes a difficulty with the process of change as being related to the meaning of the educational change in question and suggests that "neglect of the phenomenology of change – that is, how people actually experience change as distinct from how it might have been intended – is at the heart of the spectacular lack of success of most social reforms" (p. 8). Gay (2000) asserts that most research recognize that teachers are curriculum developers within their own classrooms. Teachers are more than curriculum implementers as all classrooms are unique, therefore, the curriculum is adapted by the teacher to suit the needs of their particular classroom (Fishman & Krakcik, 2003).

Teachers are pivotal to the success of any curriculum implementation (Fishman & Krajcik, 2003; Fullan, 1993; Fullan, 2007; O'Sullivan, 2002; Pinto, 2005; Snyder, et al, 1992). Fullan (2007) even laments that curriculum implementation "would all be so easy if we could legislate changes in thinking" (p. 129). Pinto (2005) identifies that either consciously or unconsciously, teachers take new curriculum proposals and interpret, categorize and select which of those they will take on and which they will not. In summarizing the work of four research teams studying curriculum innovations in science, of which Pinto was apart of, it was repeatedly seen that "simple acceptance of a rationale does not imply that it will be put into practice. Even a real willingness to implement a curriculum innovation doesn't necessarily lead to its faithful implementation"

(Pinto, 2005, p. 8). Teachers who then express an unwillingness to implement a curricular innovation almost certainly do not implement a curriculum innovation.

2.3 Conceptual Framework

To look at the issue of Biology teacher's perspectives on including an Aboriginal perspective into the curriculum, part of a framework developed by Rogan and Grayson (2003) will be used. Rogan and Grayson hypothesized that implementation can revolve around three major constructs: Profile of Implementation, Capacity to Support Innovation and Support from Outside Agencies. The 'Profile of Implementation' is based on the idea the implementation of curriculum proceeds in steps and is not all or nothing (Rogan & Aldous, 2005) as Fullan (2007) notes by suggesting the practicality of implementation relies on the ability to see the next step. This could be used to conceptualize levels of implementation of new curriculum. The construct 'Outside Support' looks at material and non-material support and pressures used to create change (Rogan & Aldous, 2005). 'Capacity to Support Innovation' is the most important construct for this study as it is "an attempt to understand and elaborate on the school-based factors that are able to support, or hinder, the implementation of new ideas and practices" (Rogan & Grayson, 2003, p. 1186). Key to this is the beliefs and opinions held by teachers identified as teacher factors. Teacher factors include background training, level of confidence, commitment to teaching and value placed in the new idea or practice (Rogan & Grayson, 2003).

While Rogan and Grayson (2003) initially developed the framework to view emerging science curriculum in developing countries, the framework remains valid for developed countries with the understanding that the focus for implementation may be more heavily weighted in another construct (Rogan, 2007; Rogan & Aldous, 2005). For developing countries, physical resources are extremely important; however in developed countries where physical resources may be more equitable, the focus may become teacher factors. Malcolm, Keane, Hoolo, Kgaka, and Owens (2000) suggest in their study of similar South African high schools producing very different exam results, that in the early stages of curriculum implementation, teacher and school factors are the largest contributors to the Capacity to Support Innovation. Due to limited time in the data collection phase of this study, I will be focusing my investigation on the implementation of Aboriginal perspectives by attending to the teacher factors described in the Capacity to Support Innovation. However, questions during the interviews will also include teacher perspectives related to various aspects within each of the three constructs.

2.4 Aboriginal and Scientific Worldviews

Nadasdy (1999) identifies a traditional worldview as qualitative, intuitive, holistic and oral, while a scientific worldview is characterized as quantitative, compartmentalized, analytical, reductionist and literate. Scientific knowledge and Aboriginal knowledge are organized in very different ways. Berkes (1999) has described scientific knowledge as logical, general, universal and disembedded.

This scientific organization is derived from what Balick and Cox (1999) describe as "the acquisition of knowledge based on careful observation and experimental tests of theory" (p. 3). Scientific knowledge is passed on through scholarly journals or in conversations with so called 'experts'. Science is often accepted as the truth and many theories are developed as a result of extending this truth without firsthand knowledge or experience from the researcher. Meaning, the researcher builds upon existing theories, for example structure of an atom, without firsthand knowledge of the original work. The researcher in this case assumes the current accepted structure of the atom is correct and proceeds from there.

Baker (1996) identifies the term "indigenous science" as slowly moving into the literature. He differentiates indigenous science from Western science as consisting of sets of explanations which seek to make sense of the world through informal theory and experimentation. These explanations have become part of indigenous groups' oral traditions and have been validated. Baker suggests three major views on the question of indigenous science. The first view rejects the idea that science can exist outside the scientific community. The second view maintains a distinctive indigenous science and is expressed by those who support multicultural science. The third view is the socio-cultural perspective, which suggests that different worldviews interpret reality in different ways. In this perspective there would be no indigenous science per se but it would exist as a differing worldview. Snively and Corsiglia (2001) have defined indigenous science as the interpretation of "how the local world works through a particular cultural perspective" (p. 10) which may be through an Aboriginal perspective.

Aboriginal knowledge has been described as contextual, common sense, embedded within a particular culture or society (Agrawal, 1995) and committed to the local environment (Berkes, 1999). In contrast to scientific knowledge, Aboriginal knowledge "does not aim to control nature, and is not primarily concerned with principles of general interest and applicability" (Berkes, 1993, p. 4). Knowledge may be passed through stories and can involve direct observation in this world or in the spiritual world which might include dreams and visions (Watson and Goulet, 1992). Agrawal (1995) suggests the difference between Aboriginal knowledge and scientific knowledge is due to different world views associated with methodology and epistemology. The concepts in science are objective and analytical, while those concepts associated with Aboriginal knowledge are not necessarily objective or rigorously analyzed (Agrawal, 1995).

The differing worldviews suggest tensions exist between Aboriginal knowledge and scientific knowledge, which speaks to the struggles teachers may have while attempting to incorporate an Aboriginal perspective in their teaching of science classes. In addition to these differing worldviews, science may be seen as a subculture of Western society, adding to the tension which exists between Aboriginal and scientific knowledge.

2.5 Science as a Subculture of Western Society

Driver, Asoko, Leach, Mortimer and Scott (1994) suggest that contemporary perspectives on science education are based on a constructivist position in which knowledge is built by the learner and not transmitted directly

from one person to another. Colburn (2007) states that "constructivism is the basis for standards, inquiry-based instruction" (p. 10) and learning. Students arrive to classes with ideas which may be different from those which are accepted by the scientific community (Colburn, 2007). Because of this constructivist position for both teaching and learning, science knowledge is socially constructed and "communicated through the culture and social institutions of science" (Driver, et al, 1994, p. 6). Driver, et al, present brief episodes of teaching situations which illustrate the social construction of learning science and they suggest that science learning is a process of enculturation. Continuing with this idea, Aikenhead (2001) concurs with the idea of science education as a cultural perspective and believes it is founded on the principle that Western science is a cultural entity. Learning science is therefore, a cross-cultural event for many non-Western students. Snively and Corsiglia (2001) suggest that "non-Western and minority culture students of Western science may be forced to accept Western value and assumptions about political, social, economic, and ethical priorities in the course of receiving instruction on Western science" (p. 24).

In order to help students to become more successful, students require someone, who Aikenhead (2001) identifies as the teacher, to help students cross this cultural border. Aikenhead borrows the term cultural border crossing from Giroux's (1992) *Border Crossings*, which discusses critical pedagogical practice and the role cultural workers may play in this practice and across disciplines including sociology, psychology and education. The teacher as cultural broker, could act to acknowledge the existence of the border, motivate students to cross

the border and keep track of instances where cultural compromises may arise (Aikenhead, 2006). Ogawa (1995) in suggesting science education may be presented from a multiscience perspective, concluded that both Western and non-Western students view Western science as foreign for similar reasons. Western students have preconceived commonsense understandings about the world, which may be in opposition to Western science, just as non-Western students have acquired a cultural perspective that may interfere with learning Western science (Ogawa, 1995).

Aikenhead (1996, 1997, 2001, 2006) and Ogawa (1995) would likely disagree with Berkes (1999) who suggested that scientific knowledge is disembedded compared to Aboriginal knowledge, which is embedded within a particular cultural group. Both Aikenhead and Ogawa have identified scientific knowledge as embedded within Western culture, which may further speak to the difficulties in attempting to incorporate an Aboriginal perspective into science classes. The idea of science as a subculture of a Western perspective (Aikenhead, 2001), suggests tensions exist between scientific worldviews and Aboriginal worldviews.

In addition to the differing worldviews between Aboriginal knowledge and scientific knowledge, tensions may exist due to the embeddedness of science within a Western culture or philosophy. This suggests investigations, such as this study, which look at these tensions is warranted. These differing worldviews and science as subculture of Western society have important implications for the learning and teaching of Aboriginal and non-Aboriginal students and for the

incorporation of Aboriginal perspectives into the curriculum for both Aboriginal and non-Aboriginal students and teachers.

2.6 Learning and Teaching Aboriginal and Indigenous Science

Aikenhead (1996) describes the goals of conventional science curriculum as "cultural transmission of canonical science content (the knowledge, values, and skills used by the scientific community)" (p. 223). This goal is achieved either through enculturation, in which the canonical science content is in harmony with the students indigenous worldview and incorporated into their personal view of the world; assimilation, where the canonical science content is at odds with the students indigenous worldview, in which case their indigenous views are marginalized; or Fatima's rules, where scientific thinking does not exist for the student but the teacher and students play "games" where the student gets a passing or high grade (Aikenhead, 1996). In most cases, school science perpetuates the notion that Western science should dominate a person's thinking and marginalize an Aboriginal perspective.

Kawagley, Norris-Tull, and Norris-Tull (1998) use evidence from the Yupiaq culture in South-Western Alaska to demonstrate scientific knowledge and epistemology which differ from Western science. They describe science classes as presenting mainly irrelevant information, taught primarily through textbooks and being graded competitively. This is in stark contrast to Yupiaq culture, which values cooperation and oral tradition. Yupiaq students have been disenfranchised by what material is taught and how the material is taught (Kawagley, et al, 1998).

In order to combat this issue, Kawagley, et al, call for curriculum reform, which integrates an Aboriginal worldview, knowledge and culture.

While teaching a course on Canadian Aboriginal children's literature, Doig (2003) identified that spirituality was often the missing ingredient which allows for Aboriginal students to discover their perceptions and feelings. This in combination with holistic and transformative teaching would allow for learning to reside within the learner and not within a body of knowledge that is decontextualized (Doig, 2003). Doig suggests that, "spirituality is the missing ingredient that makes traditional Aboriginal education and the Western system of education compatible" (p. 144). The question then becomes how to incorporate spirituality into science education, which is seemingly more difficult given the tensions that exist between a Western scientific perspective and Aboriginal perspective than in a university level children's literature class.

The differences between Aboriginal knowledge and scientific knowledge are necessary to acknowledge for this investigation, as these factors will influence how teachers view curriculum implementation. Substantial difficulties with integration of Aboriginal perspectives exist for teachers and the impact has been profound on both students and teachers.

2.7 Difficulties With Aboriginal Perspectives Integration

The Coalition for the Advancement of Aboriginal Studies (CAAS) (2002) have expressed some reasons why implementation of Aboriginal perspectives in the curriculum is important and why teachers may be experiencing difficulties in

incorporating Aboriginal perspectives. CAAS has the goal of ensuring "that all students who graduate from Canadian schools achieve a minimal set of learning expectations which reflect Aboriginal perspectives on First Peoples' and Canadian history and culture" (p. viii). CAAS produced *Learning About Walking in Beauty: Placing Aboriginal Perspectives in Canadian Classrooms* as a continuing education project attempting to inform Ontario education policy. CAAS suggests that both Aboriginal and non-Aboriginal students are receiving a curriculum that is narrow and limited and presents stereotypes concerning Aboriginal peoples. The real concern they feel is that "the impact of [the narrow and limited curriculum] on Canadian young people, who will become Canada's voters, policy makers, teachers, employers, tradespeople, judges and other professionals, is profound" (CAAS, 2002, p. 16). The suggestion being that young people will be developing the new policies that inform Aboriginal issues in Canada in the near future. A limited experience with Aboriginal issues would then mean uninformed policy. CAAS suggests teachers have difficulty incorporating Aboriginal perspectives in the curriculum because the teachers are not prepared or trained, the purchase of resources in schools with a limited Aboriginal student population may not be justified, and in some cases the incorporation of the Aboriginal perspectives may not be mandated or required.

Implementation of Aboriginal perspectives has occurred across curricula in Canada, as well as internationally. In Alberta, den Heyer (2009) describes the uneasiness with which incorporation of Aboriginal perspectives have caused in the new Alberta Social Studies curriculum. den Heyer engaged in individual and

group open ended interviews with five pre-service university instructors designed to "identify and re-evaluate … operating assumptions about curriculum as it related to teacher education in general and to the new program of study more specifically" (p. 344). From these interviews, information that was repeated or of particular interest to the researchers was extracted and analyzed. den Heyer was particularly interested in the debate between instructors that seemed to develop surrounding the inclusion of Aboriginal perspectives in the Alberta Social Studies curriculum. From these conversations, den Heyer suggests that these multiple perspectives, particularly those centered on Aboriginal perspectives, highlight or heighten existing tensions between Aboriginal and non-Aboriginal people.

A consideration that needs to be made is the bias that den Heyer (2009) acknowledges prior to the presentation of these conversations and conclusions. Information was extracted from interviews concerning how teacher education related to the new social studies program of study and these discussions were not necessarily focused on the incorporation of Aboriginal perspectives in the curriculum. Specific information was extracted from a larger and more diverse conversation. den Heyer also makes an underlying assumption that teacher educators will have issues with the incorporation of Aboriginal perspectives in the curriculum by suggesting that "issues related to Aboriginal perspectives … elicit difficult emotions that reflect a colonial legacy, ongoing land disputes (including land from which great oil and gas wealth is currently being extracted), and material and symbolic divisions between Aboriginal and non-Aboriginal Alberta" (p. 344). While not necessarily a false assumption, den Heyer presents a

bias in suggesting that a tension does exist between Aboriginal and non-Aboriginal people which directly impacts delivery of curriculum.

Compounding the tensions suggested by den Heyer (2009) between Aboriginal and non-Aboriginal people, are the tensions that exist between Aboriginal students and non-Aboriginal teachers (Taylor, 1995). Taylor (1995) describes, using his experience on a band-operated school in Western Canada as well as the experiences of others, the struggles which exist between non-Native teachers teaching in Native communities. These struggles include, the temporary nature of many non-Native teachers in the community, non-Native teachers locating culturally relevant and appropriate materials, and presentation of a culture which is unfamiliar to them. Taylor suggests that many non-Native teachers teach in Native communities to gain employment elsewhere later, to acquire money to for example, pay off a student loan, or they see teaching in the Native community as an adventure. Many non-Native teachers experience culture shock that Taylor describes as "a state of mind. It occurs when a person is faced with an unfamiliar environment. The person no longer has the usual set of social stimuli to encourage appropriate behavior. The result is often poor communication and strained relationships" (p. 227).

This idea of culture shock could be applied to any person attempting to integrate a perspective unfamiliar to them, for example a non-Aboriginal teacher incorporating an Aboriginal perspective. Taylor (1995) felt after teaching for a few years that there was little to no support for culturally appropriate teaching or materials which perhaps increased the tension the non-Native teachers felt and

contributed to their temporary stays in the Native communities. Although Taylor presents interesting ideas, none of the experiences of the other teachers were recorded and instead were recalled by Taylor. The information presented by Taylor, therefore, needs to be interpreted in the given context.

Tensions may also exist for some Aboriginal students, particularly in relation to science education. Science education can be seen as cultural acquisition, requiring Aboriginal students to cross a cultural border (Aikenhead, 1997). Aikenhead (1997) engages in a literature review to explore science from a cultural perspective, specifically in relation to Aboriginal science education. He acknowledges the common features of Aboriginal and Western knowledge, such as empirically derived, rational, communal and ideological, and goes on to suggest that "because the subculture of science tends to permeate the culture of those who engage it, curriculum specialists and teachers need to develop a science curriculum that explicitly eschews assimilation and vigilantly circumvents unwanted acculturation" (p. 228). Teachers therefore, need to be the people who identify these cultural border crossings and guide students so that the students feel their cultural ways of knowing are validated. When teachers do not navigate this space with their Aboriginal students, tension may develop for the student and the teacher. What is unclear from the literature is whether a cultural border crossing occurs when the students and teacher are non-Aboriginal attempting to explore Aboriginal contexts.

Of particular importance to this study are the difficulties experienced by the science teachers. This investigation will attempt to expand on the difficulties

faced by teachers attempting to integrate Aboriginal perspectives by focusing on why teachers are experiencing this difficulty. In addition to the difficulties experienced by teachers, some teachers are seeing success.

2.8 Successes with Aboriginal Perspectives Integration

Although there are many descriptions of the tensions that exist with integrating an Aboriginal perspective (den Heyer, 2009; Taylor, 1995; Witt, 2006), some teachers are seeing success with the integration of Aboriginal perspectives. Goulet (2001) describes the practice of two teachers of Aboriginal students who are seen by colleagues and the communities where they teach as successful. Goulet suggests "social struggles are enacted in classroom practice where Aboriginal students can encounter an ethnocentric curriculum, authoritative relationships, racist attitudes, and prejudicial beliefs about their inferiority or deficits" (p. 68). The successful teaching practice of Roxanne and Janet, two teachers of Aboriginal students, are discussed by Goulet as a counterexample of the aforementioned struggles Aboriginal students face in the classroom. Roxanne and Janet, incorporate culture and language in their teaching, "consider the contexts of the individual, community, and larger society" (Goulet, 2001, p. 80) and develop relationships with students, parents and grandparents outside the formal schooling structure. In these ways, Roxanne and Janet have incorporated a holistic teaching and learning philosophy, which has been well received by individual students and the community as a whole. Smith (2001) proposes, "Aboriginal students require curricula that incorporate their holistic perspective"

(p. 86). When this holistic teaching takes place, students are able to blend Aboriginal and Eurocentric or Western views in a successful way as demonstrated by Roxanne and Janet.

Witt (2006) identifies Saskatchewan as the province which will have the "highest percentage of Aboriginal people among its citizens" (p. 348). Because of this, Saskatchewan classrooms will also have a high percentage of Aboriginal students in the classroom. Witt contends that teachers have a pivotal role in reinforcing Aboriginal identity and that simply adding Aboriginal content will not be sufficient. Incorporating an Aboriginal perspective is not the same as adding content pieces. Statistics Canada (2006) suggests a similar situation to that in Saskatchewan will also be present in Manitoba.

To combat the issue of simply adding content pieces in Manitoba, Labelle and Manitoba Education and Youth (2003) have produced a resource document to help curriculum developers, teachers and administrators incorporate an Aboriginal perspective into the curriculum. In this resource document, a brief history of Aboriginal people and education is presented and specific learning outcomes are identified for each division (early years, middle years and senior years). Two such learning outcomes presented by Labelle and Manitoba Education and Youth for science are "demonstrate awareness that Aboriginal peoples had effective medicines prior to European contact" (p. 37) and "describe the similarities and differences in the views held by government policy and local Aboriginal peoples toward resource use and management" (p. 37). This document is intended to specify specific objectives which need to be covered in the curriculum, in contrast

to the Alberta Biology 20-30 Program of Studies (Alberta Education, 2007), which is vague and does not contain specific objectives a teacher is required to teach concerning Aboriginal perspectives.

This section has identified two teachers successful integration of Aboriginal perspectives in the curriculum and emphasized the importance of clear objectives in developing resources. As demonstrated above, not all teachers are experiencing difficulties in incorporating Aboriginal perspectives in the curriculum, particularly when the teachers see value in the incorporation. This possibility therefore, needs to be considered and investigated.

2.9 Teacher's Views on Aboriginal Perspectives Integration

The majority of the work looking at teachers' views concerning the incorporation of Aboriginal perspectives in the curriculum in Canada has come from Saskatchewan and Manitoba. In a survey of 17 provincial and 10 First Nations jurisdictions in Saskatchewan and Manitoba, Wotherspoon (2007), asked "what do teachers have to say, and what can they tell us, about their experiences in working with Aboriginal communities? How do they see their role in the advancement of equity objectives for Aboriginal people" (p. 64)? Wotherspoon found that less than one in seven respondents did not think schools should enact some educational equity measures so that Aboriginal students would be ensured some success. Most teachers also identified some educational equity measure initiatives in their schools or their own teaching. Wotherspoon engaged in this research because "teachers' perspectives and voices are often absent from, or have

a low profile within, general discourses on educational improvement for Aboriginal people" (p. 64). This is an interesting statement given teachers are the people who interact daily with students.

One concern with this study was that Wotherspoon (2007) did not indicate how many teachers responded to the study, nor did he identify the backgrounds of the teacher respondents including grade level or subjects taught. The only specific feature mentioned about the teacher respondents was the teachers were teaching in Aboriginal communities or classes with predominantly Aboriginal students. Another concern was that the methodology was not outlined very well. In fact, no mention was given to the survey questions or whether Wotherspoon was engaging in a qualitative, quantitative or mixed methods approach, although is appears to be mixed methods as percentages of respondents and written data are presented.

Aikenhead and Huntley (1999) investigated teachers' views on Aboriginal students learning science. They looked at how science teachers considered Western science, how the teachers include Aboriginal science and the beliefs the teachers had concerning how Aboriginal knowledge influenced learning Western science (Aikenhead & Huntley, 1999). Aikenhead and Huntley found that although teachers would not define science, they had different ideas as to what science was. This idea of science also changed in different contexts; the teachers did not feel that science may be a foreign culture experienced by their students (Aikenhead & Huntley, 1999). This is in contrast to what Aikenhead (1997) had concluded regarding science education and Aboriginal students, where science

could be seen as a cultural acquisition by the students. Teachers also felt that Aboriginal knowledge was important, yet most did not integrate Aboriginal perspectives in their teaching and instead added on content (Aikenhead & Huntley, 1999). Aikenhead and Huntley stated that

> Our non-Aboriginal teachers were articulate and persuasive in denying any cultural conflict between Aboriginal and scientific ways of knowing. All teachers interviewed, including the four Aboriginal teachers, thought that the ease of learning science had nothing to do with students' possessing an Aboriginal world view. (p. 167)

One of the teacher participants, acknowledged that chemistry theory conflicted with traditional values but conveyed that students' did not have to believe an idea to pass a test (Aikenhead & Huntley, 1999). Although this is an important point, it does suggest that at least some of the teachers interviewed were not incorporating Aboriginal perspectives in the classroom in any meaningful way. If not done in a meaningful way, does this suggest teachers do not see value in incorporating an Aboriginal perspective? Aikenhead and Huntley conclude that students who are disconnected from their culture may not find a curriculum framed by an Aboriginal worldview relevant. This may be too bold a statement given that only teachers' perspectives were investigated.

Kanu (2005), looked more specifically about how teachers perceived the integration of Aboriginal culture in the high school curriculum. This study looked at ten social studies and English language arts teachers from three inner-city high schools in Winnipeg, which contained a mix of Aboriginal and non-Aboriginal

students. Kanu used an ethnographic research methodology, incorporating the use of classroom observations, teachers' journals, and interviews, although the majority of the analysis relied on the interview data. The purpose of this investigation was to address the current knowledge gap in relation to teachers' perceptions of curricular innovations, specifically Aboriginal perspectives, as most research has focused on students' reactions to these curriculum integrations.

During ongoing analysis, Kanu (2005) concluded that teachers felt integration of Aboriginal perspectives was crucial. However, the teachers understood and approached integration differently. The teachers in the study integrated Aboriginal perspectives based on the first three of Banks (2004) levels of integration of multicultural perspectives. Although Kanu used several different frameworks during her analysis, including, sociocultural theories of cognition and learning, radical multicultural theories of education and psychological theories related to the relationship between internal constructs and external behaviors, when looking at teachers' understandings of and approaches to integration, Banks' integration of multicultural perspectives was utilized.

Banks' (2004) integration of multicultural perspectives contains four levels. Level one is the contributions approach, which involves a focus on holidays and discrete elements of the culture such as food or festivals (Banks, 2004). In this approach there is no meaning given to the holidays or cultural elements. The second level is the additive approach, which is when content or perspectives are added to the curriculum without changing the structure of the curriculum (Banks, 2004). This may be in the form of addition of books or a unit

to the curriculum without substantially changing the curriculum. The third approach is the transformation approach, which is when "students view concepts, issues, themes, and problems from several ethnic perspectives and points of view. The mainstream-centric perspective is one of only several perspectives" (Banks, 2004, p. 250) an issue is viewed from.

In Kanu's (2005) investigation, the teachers did not employ Banks final level, the social action approach. The social action approach includes the transformation approach with the added component of students making decisions related to issues or problems. In addition to differences regarding integration, Kanu found that teachers identified "teachers' own lack of knowledge about Aboriginal cultures; the lack of Aboriginal classroom resources' the racist attitudes of non-Aboriginal staff and students; school administrators' lukewarm support for integration; and incompatibility between school structures and some Aboriginal cultural values" (p. 57) as barriers or challenges to integration.

2.10 Gaps in the Literature

While investigations surrounding the incorporation of Aboriginal perspectives have been done, they often focus on the students' response to the curricular implementation (Kanu, 2005). The investigations typically profile teaching situations with large proportions of Aboriginal students often being taught by non-Aboriginal teachers (Aikenhead & Huntley, 1999; Goulet, 2001; Kanu, 2005; Taylor, 1995; Wotherspoon, 2007). Statistics Canada (2006) report that 5.8% of Alberta's total population identify themselves as Aboriginal (First

Nation, Métis, or Inuit). This means there are many areas located within Alberta that have an extremely small Aboriginal population which leads to the main question of this investigation: How do non-Aboriginal teachers of Biology, conceive of incorporating Aboriginal perspectives into their teaching of Alberta Biology classes?

Considering there are many areas located within Alberta with very low Aboriginal student populations, how these teachers incorporate Aboriginal perspectives into the curriculum when even Aikenhead and Huntley (1999) who encourage a curriculum which contains Aboriginal perspectives, suggest that those students who do not have cultural ties to Aboriginal culture may not see the relevance of a curriculum framed by an Aboriginal world view. If the students do not see the relevance, will the teachers? Have the teachers? This suggests an important subsidiary questions for this study: What value do teachers see in incorporating Aboriginal perspectives?

There has also been a gap when related to the lack of focus on the viewpoint of science educators (Goulet, 2001; Kanu, 2005; Taylor, 1995). Goulet (2001), Kanu (2005) and Taylor (1995) each focused on elementary teachers, social studies and English language arts teachers, and curricular generalists, respectively. Although Aikenhead and Huntley (1999) discussed science teachers' perspectives, they did not identify the grade levels their teacher participants taught, nor did they identify the proportion of Aboriginal versus non-Aboriginal students in the classrooms. Very little has been written about how science teachers incorporate Aboriginal perspectives into their teaching, therefore

an important question to investigate in this study is: How do science teachers incorporate Aboriginal perspectives in their teaching? For this study, I chose to focus on Biology teachers as having taught Biology, Chemistry and Physics, I see a greater ability in incorporating Aboriginal perspectives in a meaningful way into the Biology curriculum. A further study could be to address whether the views regarding Aboriginal perspectives integration changes with teachers of different scientific disciplines.

The primary Canadian literature addressing teacher viewpoints concerning integration of Aboriginal perspectives have come from Manitoba and Saskatchewan (Aikenhead & Huntley, 1999; Goulet, 2001; Kanu, 2005; Witt, 2006; Wotherspoon, 2007), which may not accurately or adequately represent an Alberta perspective. What supports teachers utilize or have access to while preparing lessons which incorporate an Aboriginal perspective is an important consideration for this study, particularly because the resources typically profile how to incorporate Aboriginal perspectives for Aboriginal students. Although this study is framed within an Alberta context, the findings should be useful for any context in which science educators are incorporating a perspective which may be foreign to themselves and their students.

How science teachers are incorporating Aboriginal perspectives in the curriculum is important if one considers that a Western scientific perspective and an Aboriginal perspective are diametrically opposed. If teachers are an instrumental factor in curriculum implementation as multiple researchers have suggested (Fishman & Krajcik, 2003; Fullan, 1993; Fullan, 2007; O'Sullivan,

2002; Pinto, 2005; Snyder, et al, 1992), then the success or failure of the incorporation of Aboriginal perspectives rests on the views that teachers hold regarding this incorporation.

Chapter Three

Methodology

3.1 Research Methodology

3.1.1 Quantitative/Qualitative Debate

Quantitative and qualitative research use "different techniques of presentation to project divergent assumptions about the world and different means to persuade the reader of its conclusions" (Firestone, 1987, p. 16). Quantitative methods are usually based on a positivist paradigm (Firestone, 1987) which asserts the benefits of truly scientific sociology and that the highest form of knowledge is description of sensory phenomena (Blackburn, 2008). Qualitative research is often based on a phenomenological paradigm (Firestone, 1987) based on the description of experience (Blackburn, 2008).

Ercikan and Roth (2006) describe quantitative researchers as objective and research should be able to be replicated and generalized. Creswell (2009) identifies quantitative research as a "means for testing objective theories by examining the relationship among variables" (p. 4). Quantitative researchers engage in deductive theory testing, protecting against bias, generalizing findings and focus on the ability to replicate the findings (Creswell, 2009). In this way quantitative research persuades by emphasizing established data collection and analysis procedures and reducing individual judgment (Firestone, 1987).

Qualitative research in contrast is context based and the quality of the research is enhanced by the inclusion of the researcher's perspective (Ercikan & Roth, 2006). Qualitative research is "a means for exploring and understanding the

meaning individuals or groups ascribe to a social or human problem" (Creswell, 2009, p. 4) and presents a complex view of the world (Firestone, 1987).

Firestone (1987) describes two groups, the purists and the pragmatists, who are at opposite extremes with regards to quantitative and qualitative methods. The purists suggest the two methods make completely different assumptions about the world and are therefore incompatible, while the pragmatists advocate that the method types can be associated with either paradigm (Firestone, 1987). I would tend to identify myself as a pragmatist because I do not believe the method types are incompatible and in fact see the value in combining method type. This type of mixed method research minimizes the weaknesses and highlights the strengths of quantitative and qualitative research (Johnson & Onwuegbuzie, 2004).

Ercikan and Roth (2006) suggest that "the quantitative-qualitative dichotomy is not appropriate for distinguishing forms of education research because … all phenomena are quantitative and qualitative at the same time" (p. 18). Many researchers have suggested that mixed methods research may be an appropriate alternative to the dichotomy (Creswell, 2009; Ercikan & Roth, 2006, Johnson & Onwuegbuzie, 2004). Mixed methods research is an approach which combines aspects of both quantitative and qualitative forms (Creswell, 2009).

3.1.2 Study Methodology

For this investigation, qualitative methodology has been chosen due to the exploratory nature of the study, investigating how teachers conceive of

incorporating Aboriginal perspectives into their delivery of the Alberta Biology curriculum. Qualitative methodology is a means for exploring understanding (Creswell, 2009) and is context based (Ercikan & Roth, 2006), as is this study. One concern with qualitative research is that the findings are not able to be generalized to the larger population (Creswell, 2009). However, this study is not attempting to generalize findings. Instead the goal of the study was to investigate some of the ways teachers conceive of incorporating Aboriginal perspectives. Further consideration could be given to creating a large-scale survey from these findings to quantitatively analyze teachers' views.

Yin (2009) suggests in determining a method for study, three conditions need to be considered. These three conditions include "(a) the type of research question being posed, (b) the extent of control an investigator has over actual behavioral events, and (c) the degree of focus on contemporary as opposed to historical events" (Yin, 2009, p. 8). For this investigation, case study was chosen as exploratory case studies

> seek to define research questions of a subsequent study or to determine the feasibility of research procedures. These designs are often prelude to additional research efforts and involve fieldwork and information collection prior to the definition of a research question. (Hancock & Algozzine, 2006, p. 33)

Yin (2009) suggests a case study is "the preferred method when (a) "how" or "why" questions are being posed, (b) the investigator has little control over events, and (c) the focus is on contemporary phenomenon within a real-life

context" (p. 2). For this investigation, I am asking a "how" question, I am not manipulating or controlling the events and I am focusing on a contemporary phenomena, which is the incorporation of Aboriginal perspectives, something happening provincially, nationally and internationally (den Heyer, 2009).

A case study is typically associated with qualitative research, although quantitative data may be used (Gerring, 2007). It is an intensive analysis and description of an individual, event, or group which is bounded by space and time (Hancock & Algozzine, 2006). Researchers using case studies "hope to gain in-depth understandings of situations and meaning for those involved" (Hancock & Algozzine, 2006, p. 11). Hancock and Algozzine (2006) describe case study research as being more exploratory than confirmatory in that the researcher normally identifies themes of behavior and events and does not typically attempt to prove relationships or test hypotheses.

The unit of analysis in a case study is the "case" and is determined by the initial research question (Yin, 2009). Gerring (2007) describes the "case" as a "delimited phenomenon (a unit) observed at a single point in time or over some period of time" (p. 19). For this investigation, the unit of analysis is the integration of Aboriginal perspectives in Biology classes. The basic design used for this case study is a multiple case design. Each teacher is the subject of an individual case study but the study covers Biology teachers as a whole, so in this way it is a multiple case design. Because the data will be not be pooled across all teachers, this is a holistic, multiple case design (Yin, 2009).

3.2 Participant Recruitment

The participants in the study are all non-Aboriginal Alberta Biology teachers who teach in schools with predominantly non-Aboriginal students. Teachers who were known to the researcher were contacted either by phone or email and invited to participate in the study. Following expression of interest, potential participants were sent either by email, fax, or mail an invitation letter (Appendix A) and consent form (Appendix B). Additional participants were recruited by the use of intermediaries (known to the researcher) to identify further participants. Intermediaries gave potential participants the invitation letter who then had the option of contacting the researcher if they chose to participate. Initially 10-12 participants were sought out for interviews. Interviews continued until data saturation was reached. Ultimately 9 participants were interviewed as the views expressed by teachers represented a range of opinion and the views expressed appeared to be similar, with nothing apparently new being identified.

3.3 Methods

3.3.1 Data Collection

Hancock and Algozzine (2006) identify semi-structured interviews as particularly well suited to case studies. They suggest that

> researchers using semistructured interviews ask follow-up questions designed to probe more deeply issues of interest to interviewees. In this manner, semistructured interviews invite interviewees to express themselves openly and freely and to define the world from their own

> perspectives, not solely from the perspective of the researcher. (Hancock & Algozzine, 2006, p. 40)

For this study, audio-taped, semi-structured interviews were conducted with each of the participants at a location of their choosing. Prior to the interview, ethical issues were reaffirmed and participants were given the option not to participate. Interview questions were derived from each of the subsidiary questions in combination with the conceptual framework (for an example of the interview questions, see Appendix C). Interviews ranged from approximately 15 minutes to 60 minutes. In addition to audio-taping the interviews, anecdotal notes were also taken as the interviews proceeded.

Following each interview, I transcribed the interviews to allow for on-going data analysis. Once the interview was transcribed, initial interpretations were formed, and given to the participants to member check. Second interviews were requested of some of the participants to further probe any emerging ideas or to build upon what was already said.

3.3.2 Data Analysis

Stake (1995) suggests analyzing case study data by first providing for a rich description of the individuals in the case and then analyzing interviews for themes or issues. For this investigation, interview data was coded based upon the various themes surrounding the three constructs of the conceptual framework (Rogan & Grayson, 2003; Rogan & Aldous, 2005). Creswell (2009) discusses the issue of whether codes should only be developed based upon emerging information, using predetermined codes or some combination of emerging and

predetermined codes. For this investigation the conceptual framework provided a distinct theory (Creswell, 2009), therefore predetermined codes were derived from this framework. However, allowing for emerging definitions of the codes increased the validity and reliability of the data analysis. I initially read through the transcripts completely and then identified information which corresponded to defined codes using color-coding. Emerging themes were redefined and information was constantly compared with the defined terms.

The type of analytic technique that was used is explanation building (Yin, 2009). Explanation building is a type of pattern matching which is commonly used in exploratory case studies. Yin (2009) suggests that "the better case studies are the ones in which the explanations have reflected some theoretically significant propositions" (p. 141). This investigation is based upon a framework that has been used in other situations to explain how a curricular implementation has occurred. Therefore, explanation building was well suited to this study. An important aspect of explanation building is entertaining other possible explanations (Yin, 2009), which was built into the data analysis for this investigation by allowing for emerging definitions that were counter to the definitions provided in the current framework.

3.3.3 Validity and Reliability

Creswell (2009) defines qualitative reliability as consistency of approach. In order to do this, Creswell (2009) and Yin (2009) suggest documentation of as many steps of the procedure as possible and other reliability procedures, including cross-checking codes, checking transcripts and writing definitions of codes and

constantly comparing data with those definitions of the codes. For this investigation, transcripts were rigorously checked. Definitions of codes were cross-checked with independent researchers to ensure reliability.

Qualitative validity, "means that the researcher checks for the accuracy of the findings" (Creswell, 2009, p. 190) by using multiple strategies to enhance the researcher's ability to evaluate the precision of findings. For this investigation, member checking was done to ensure that the interpretations from the interview data was accurate. Participants were provided with the either the transcript or emerging data to verify what they had said or to add or eliminate any statements. Finally, second follow-up interviews were done with some participants to verify any information or to allow the participant the opportunity to comment on the findings (Creswell, 2009).

Rich and thick descriptions regarding the similar or different perspectives teachers' have on the themes are provided so that the results will be more realistic. Along with this, I have clarified any bias I brought to the study. Creswell (2009) suggests "good qualitative research contains comments by the researchers about how their interpretation of the findings is shaped by their background" (p. 192). A detailed description of my bias is provided in the analysis section.

To add credibility to the findings, negative or discrepant information that is in opposition to the themes is presented. In addition, both peer debriefing and the use of an external auditor was utilized. Peer debriefing involves "an interpretation beyond the researcher and invested in another person" (Creswell, 2009, p. 192) which increases the validity of the account. An external auditor

reviews the entire project and is someone is not familiar with the project. This allows for an objective assessment of the project (Creswell, 2009).

A criticism of qualitative research is that validity and reliability are more difficult to achieve than in quantitative research (Creswell, 2009; Stake, 1995; Yin, 2009). By ensuring that set procedures are followed during data analysis, reliability and validity of findings can be increased. In this study, I rigorously followed the procedures outlined above in order to accurately portray any findings.

3.4 Ethical Issues

To ensure all ethical considerations were accurately assessed, this study was reviewed by the Education, Extension, Augustana, Campus Saint Jean Research Ethics Board (EEASJ REB) for its adherence to ethical guidelines (see Appendix D for a copy of the Ethics review). In addition to ensure compliance with the requirements of the Research Ethics Board, this study also adhered to the University of Alberta Standards for the Protection of Human Research Participants. I also participated in research ethics training as part of the University of Alberta graduate program.

Anonymity, confidentiality and privacy was maintained by using pseudonyms for the participants and no mention is made to specific schools or exact locations of the schools. Participants were able to opt out of the study at any time during the interview process and up to one month after data collection without penalty of any kind. Audio-recordings of interviews, transcriptions and

data are being kept in a secure location on a password protected computer at the researchers home. Any non-digital data has been locked in a secure filing cabinet at the researchers home. After a period of five years, data will be destroyed.

3.5 Participant Profiles

All of the participants in this study identified themselves as non-Aboriginal teachers of Biology who were teaching in schools with what they considered a low Aboriginal student population. All of the participants except one were currently teaching in or were on one or two year sabbaticals from teaching in high schools with grades 10 – 12 (see Table 1 for a description of the participants). The exception was Roger who is the Assistant Dean at a large university in the local area. Roger has also authored many Biology textbooks used in Canada and the United States. There was never a plan to interview authors of textbooks during the design of the study. However, the opportunity did arise to speak to Roger, an incredibly experienced Biology educator, therefore I took the occasion to ask his thoughts on the approved textbooks for the Alberta Biology curriculum. In no way does his opinion represent all textbook authors or publishers but does provide Roger's perspective as someone who has gone through the textbook development process.

Table 1

Non-Aboriginal Teacher Participant Profiles

Name	University Degrees	Teaching Experience	Years Teaching Biology	Current Teaching Assignment	School Context
Jessica	Combined B.Ed/B.Sc	1.5 years teaching and 1 year substitute teaching	1.5 years	General Science, Biology	Comprehensive high school; outside major urban center
Silvia	B.Ed, B.Sc, M.Ed candidate	13 years	12 years	Biology, Chemistry and General Science	Comprehensive high school, including IB (International Baccalaureate); outside major urban center
Rebecca	B.Ed, B.Sc, MA	25 years	25 years	Biology, General Science, Co-department Head	Comprehensive high school, including IB (International Baccalaureate); outside major urban center
Amanda	B.Sc, B.Ed	10 years	4 years	Chemistry, General Science, Biology	Comprehensive high school; outside major urban center
Steve	B.Ed	25 years	18 years	Biology, General Science, Math, Outreach (alternative education program)	Comprehensive high school; outside major urban center
John	B.Sc, B.Ed	26 years (inturrupted by 2 years as an RCMP officer)	26 years	Physics, Math, Biology (summer school)	Comprehensive high school; outside major urban center

Hank	B.Sc, B.Ed, M.Ed candidate	11 years	10 years	On sabbatical (primarily taught Biology)	Comprehensive high school including AP (Advanced Placement); in a major urban center
Brad	B.Sc, B.Ed	18 years	18 years	On secondment (primarily taught Biology)	Comprehensive catholic high school; in a major urban center
Roger	B.Sc, B.Ed, M.Sc, PDAD (Professional Diploma After Degree) in Education, M.Ed. PhD	Numerous: junior and senior high school teacher, assistant superintendent, university educator, assistant dean, textbook author	25 years	Assistant Dean	Teacher, Vice Principal, Principal and Assistant Superintendent of a Catholic School Board in a major urban center

Chapter Four

Results and Discussion

4.1 Introduction

The primary goal of this research was to understand how teachers of Biology conceive of incorporating Aboriginal perspectives into their delivery of the Alberta Biology (Alberta Education, 2007) curriculum. The purpose was not to evaluate how well teachers were implementing Aboriginal perspectives integration or the correctness of one way versus the other. Instead, this research was a way of looking at how teachers were thinking about the implementation of Aboriginal perspectives and to gain insight into whether teachers viewed themselves as integrating Aboriginal perspectives, the value they see in this implementation and the resources teachers have access to and those they wish they had access to.

In order to view the issue of Aboriginal perspectives implementation, I propose a framework (see Figure 1) using the constructs identified by Rogan (2007), Rogan and Aldous (2005) and Rogan and Grayson (2003). The framework includes the following three constructs: Capacity to Innovate, Outside Influences and Profile of Implementation. Capacity to Innovate describes the "factors that are able to support, or hinder, the implementation of new ideas and practices" (Rogan & Grayson, 2003, p. 1186). In this study, these include themes such as teacher factors and school ethos and management. A description of each of these themes will be included later. Outside Influences describes the support from outside agencies such as a department of education. This includes themes

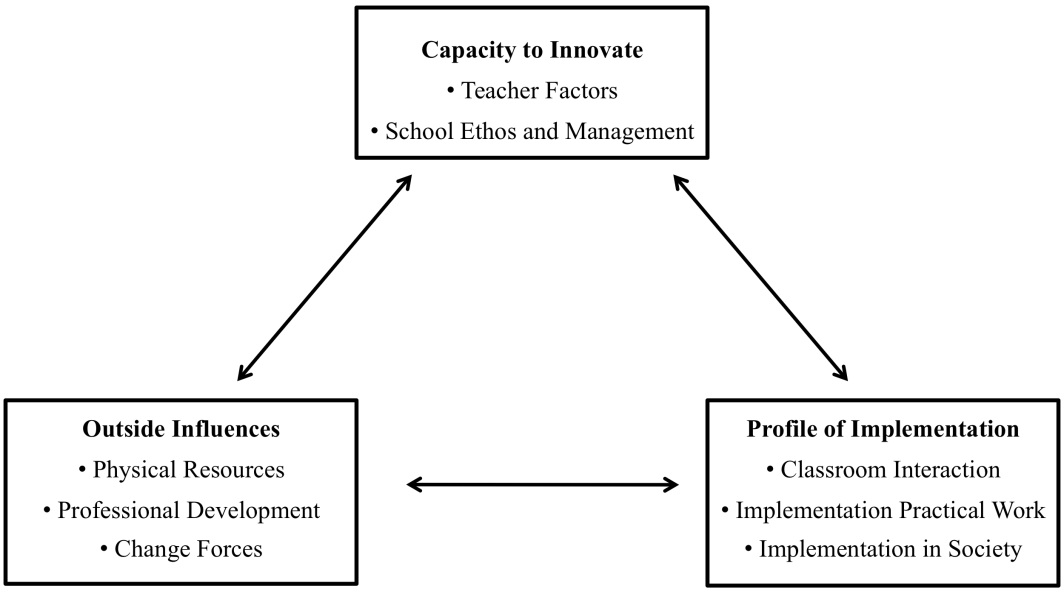

Figure 1. Proposed Conceptual Framework for Curriculum Implementation

such as physical resources, professional development and change forces. It should be noted that physical resources may also be included in Capacity to Innovate depending whether the focus is on use or design of the material. For the purpose of this investigation I will speak of physical resources under the construct of Outside Influences as the majority of participants discussed the design of resources outside of their specific professional work. Profile of Implementation describes the degree to which a particular curriculum innovation has been or is being put into place (Rogan & Grayson, 2003). As this study is not evaluating how well teachers have incorporated Aboriginal perspectives, only a very brief discussion of the themes surrounding this construct will be given. Themes include, classroom interaction, implementation practical work and implementation in society.

4.2 Capacity to Innovate

4.2.1 Teacher Factors

Teacher factors include all of the things that pertain to the teacher. This includes, their background, training, level of confidence and understanding of the implementation in question (Rogan & Grayson, 2003). Three subthemes emerged from the participants; understanding of the terms "Aboriginal" and "Aboriginal perspective"; lack of training; and a lack of confidence with integrating a distinctly Aboriginal perspective.

Understanding of the Terms Aboriginal and Aboriginal Perspective

The majority of the participants provided a definition of Aboriginal that did not explicitly align with the definition given by Alberta Education (2005a) indicating Aboriginal people are: "the descendants of the original inhabitants of North America" (p. v). The definition provided by Alberta Education has a distinctly North American perspective and includes First Nations, Métis and Inuit peoples. Unlike Alberta Education, most of the participants did not link their definition or their understanding of the program of study's definition of Aboriginal to the Canadian Constitution and its inclusion of First Nations, Métis and Inuit people. For example Jessica, Silvia, Steve and Brad all indicated that Aboriginal included First Nations people but made no mention of either Métis or Inuit. Interestingly these same participants also suggested that Aboriginal would include the original inhabitants of a particular area. Brad believed that Aboriginal means: "*the original people in terms of recorded history of a particular area*" and Steve suggested that: "*the original inhabitants might be the best way*" to describe

the term Aboriginal. In contrast, Hank, Rebecca and Roger did include all three identified groups of people by Alberta Education. In defining Aboriginal, Hank identified: "*those who have connections to First Nations, Métis, and Inuit knowledge*", while Rebecca and Roger described the acronym FNMI (First Nations, Métis and Inuit) in their formal definition of Aboriginal. The remaining participants either included some combination of First Nations, Métis and Inuit people or did not include any specific group. For example, Amanda identified Aboriginal as including First Nations and Inuit people, while John did not include First Nations, Métis or Inuit, but did suggest that Aboriginal included people who lived on reserves. It was very apparent that the participants in this study understood Aboriginal to be or include very different things which was also reflected in their different understandings of an Aboriginal perspective.

Jessica and Amanda provided a naturalistic definition of Aboriginal perspective. Amanda identified an Aboriginal perspective as being more holistic and tied to natural and environmental observations as opposed to her perspective, which she described as including data and proof. Jessica commented: "*an Aboriginal perspective is the unique whole Earth perspective, the flow of energy linking everything together, plants and animals having a spirit that corresponds with the unified Earth mother theory*". When asked later what she meant by unified Earth mother theory, Jessica was unable to articulate her meaning, which suggested she was recalling information.

Brad, Silvia, Rebecca and John all described an Aboriginal perspective as including a cultural component. For example, Rebecca identified an Aboriginal

perspective as: "*a cultural phenomena where in a group of people that are in an area for a period of time develop a way of thinking about the world and they share amongst their culture*". John suggested that an Aboriginal perspective is the viewpoint that Aboriginal people have which includes their culture and then delineated an Aboriginal perspective as being distinctly different from a non-Aboriginal persons perspective.

Both Hank and Roger both acknowledge the problematic notion of referring to just one Aboriginal perspective. For example, Roger articulated the issue as people not recognizing different groups of Aboriginal people:

> *Well, an aboriginal perspective, that's the problem is that we talk about it as if it's a perspective that all Aboriginal people have. And of course, that doesn't acknowledge the fact that there are multiple ways of viewing the world, depending upon whether you live above the 60th parallel or you live on the plains or the woodlands or, it's--that's problematic in itself. There is Aboriginal knowledge, which is a knowledge base which may different from Cree to Blackfoot to Sioux to Iroquois if you're in the east, so I guess that's one of the points that I would try to make to people is that it's not like all Aboriginal people hold the same knowledge and hold the same viewpoint. I think that comes with the first recognition that there are multiple viewpoints that pull and tug at each other*. (Roger)

Butler (2000), in discussing Aboriginal perspectives integration in Australia, concurs with Rogers and suggested that teachers often form a generic Aboriginal culture when they amalgamate Aboriginal cultural traits. This then presents

Aboriginal perspectives in terms of static and apolitical constructs, which may be viewed in a negative way.

The distinction between a traditional perspective and an Aboriginal perspective was highlighted by Hank who suggested: "*there could be traditional Aboriginal knowledge, but there could be contemporary Aboriginal knowledge as well, to deal with contemporary issues*". The idea of a contemporary Aboriginal knowledge is very similar to the difference between a traditional perspective and an Aboriginal perspective that Berkes (1999) suggests as well. Steve, however, thought that an Aboriginal perspective is more of a traditional perspective, in particular when discussing Aboriginal perspectives and science. He provided an example by suggesting that Aboriginal people reading constellations could just as easily have been anyone living "*back then*", implying a traditional perspective versus a uniquely Aboriginal perspective. Steve's thought is consistent with Groome (1994) who concluded that teachers consistently commented that they felt comfortable engaging with Aboriginal perspectives as traditional culture. With the exception of Steve, no other participant in this study equated an Aboriginal perspective with a traditional perspective, although many teachers provided examples suggesting they were comfortable discussing traditional Aboriginal perspectives versus contemporary Aboriginal perspectives.

Many participants felt as though the definition of Aboriginal perspectives provided in the program of study was vague and difficult to define. Hank expressed his interest in why there was such clarity in the ICT (information and communication technology) and STS (science, technology and society) outcomes

but a lack of specificity in the Aboriginal perspectives component of the program of study.

> *I mean, there's a few paragraphs that describe why it's important to incorporate Aboriginal perspectives, that we should encourage them, that we should support them, that we should develop them, but there aren't really these specific guidelines*. (Hank)

Other than Hank, none of the other participants could really articulate what they thought the program of studies means by Aboriginal perspective. It seemed to Amanda the program of study wants teachers to: "*pay some lipservice to maybe some discoveries that First Nations people have made or some traditions. I don't feel there's any real guidance as far as the actual way that they, that Aboriginal people would think or understand something*" while Jessica expressed she felt the definition of Aboriginal perspectives provided in the program of study was: "*very vague and difficult to determine what it is they mean by the word's Aboriginal perspective*".

Lack of Training

Kanu (2005) reported the top challenge identified by teachers to integrating Aboriginal perspectives as lack of Aboriginal knowledge and understanding. Most of the participants in this study shared the same perspective as the teachers in Kanu's study by indicating that because they did not have a strong background in Aboriginal knowledge or appropriate university training, they were experiencing difficulty in determining how to incorporate an Aboriginal perspective. Jessica expressed both of these thoughts by suggesting: "*as a non-*

Aboriginal teacher it is very difficult for me to understand the perspective as I wasn't raised that way and have had no school training in university or regular school that has helped me to foster that". Although the university Jessica attended incorporates a discussion of the inclusion of Aboriginal perspectives into their curriculum and instruction classes for pre-service teachers, Jessica does not recall any information from this. den Heyer (2009) describes a lack of clarity among instructors of pre-service Social Studies teachers regarding their beliefs in how one should approach the education of Aboriginal perspectives. This lack of clarity may also exist in other subject specialties, which could partially explain why Jessica did not feel she received a consistent message.

John felt that his lack of background related to Aboriginal perspectives did not qualify him to discuss Aboriginal incorporation to any large extent and that it would require someone with a different set of expertise. Brad also discussed his discomfort with incorporating an Aboriginal perspective as being related to his lack of awareness, knowledge and background. In addition, Brad also thought not having taught many identifiable Aboriginal students made it difficult to think about incorporating Aboriginal perspectives and trying to make the connection with non-Aboriginal students.

Silvia only felt she had received any training in Aboriginal perspectives after taking a graduate course in Ethnobiology, the study of the culture of living things, which provided some resources and information related to Aboriginal perspectives. Rebecca took the same graduate course and also felt that until the Ethnobiology course, she was unqualified due to being a: "*white person who has*

very, very little exposure to Aboriginal people". Even though Silvia and Rebecca felt they gained some background in Aboriginal perspectives by taking the graduate course, they still expressed feelings of being undertrained and unqualified to teach Aboriginal perspectives.

Lack of Confidence in Teaching a Distinctly Aboriginal Perspective

The teachers in Kanu's (2005) study also identified a lack of confidence with teaching Aboriginal perspectives associated with not having the right to teach Aboriginal content knowledge. This sentiment was true even for the teachers who identified themselves as Aboriginal. The majority of the participants in this study also felt they lacked the confidence to adequately teach with an Aboriginal perspective. While attempting to incorporate Aboriginal perspectives, Silvia was unsure whether she communicated the perspective as much as the content and more importantly questioned what incorporating an Aboriginal perspective might mean for her students. Silvia stated: "*I don't feel qualified to decide what's important and what isn't and I would like to know from the Aboriginal community what they feel is important and to try to understand why that fits into science*". Amanda expressed a similar feeling in that she did not feel confident presenting an Aboriginal perspective, as she did not know what this might possibly mean for an Aboriginal person. She further added that including more pictures and examples in a textbook would simply be adding more content and would not be integrating a perspective, which she was not necessarily comfortable with either.

Brad expressed concerns regarding effective teaching methods while integrating Aboriginal perspectives. In regards to taxonomy, he commented on appropriate delivery methods:

> *So never mind the content knowledge, but is it appropriate to even ... I've taught taxonomy lessons before in classes where I've brought in a variety, a huge number of living, nonliving organisms and so on, and had students contrive or make their own, you know, groupings. So again, to look at it from an Aboriginal perspective, would that be an effective way of doing it? I don't know. I would definitely want to know a lot more about, you know, effective teaching methods, I guess, from that particular perspective*. (Brad)

Hank, Steve and Roger all expressed confidence in teaching an Aboriginal perspective but for different reasons. Hank described a conversation he had with some Aboriginal people regarding what he might talk to students about:

> *And really, it was almost -- they just kind of laughed because they're like, "You're the teacher, you know? Teach what you know." Right? And I think it's been good for me to know that, if I can teach what I understand well and pass that on, that's good, right? But as long as I don't give up and not try to learn something new. So I feel maybe a bit more confident than I did at first*. (Hank)

Hank's confidence grew from the validation provided by someone whom he felt had the necessary authority, an actual Aboriginal person. Steve on the other hand, felt confident because of his understanding of Aboriginal perspective in the

program of study. He finds Aboriginal perspectives: "*quite easy to integrate within any lesson I might have. Any lesson that might look at an issue from its historical perspective first and then what we might do differently now*". Because Steve understands Aboriginal perspective as a historical or traditional perspective, he feels quite confident in his presentation.

Roger described his use of story telling while teaching about scientific discoveries and stories of teaching and science.

> *They remember -- and so we link that into an Aboriginal way of telling children and telling others about a way of understanding the beginning of the world, which is highly philosophical and metaphysical and complex. And so, really, that's where I use the sort of different ways of knowing*. (Roger)

In addition, Roger feels some confidence in his lack of expertise: "*I don't claim to be the expert. I claim to have made lots of mistakes and certainly not the person they should emulate because there's lots I don't know*". Roger acknowledges his lack of expertise to his students but feels comfortable learning alongside his students.

4.2.2 School Ethos and Management

School ethos and management includes administrative support and the general ecology of the school (Rogan & Grayson, 2003). Quality of leadership and levels of support are all important factors in a new curriculum implementation. Garet, Porter, Desimone, Birman and Yoon (2001) identify that a positive impact on teacher learning is seen when the teacher perceives support.

Intertwined with this is the vision that is either shared by members of the school staff or not. Schools with a shared vision are more likely to support the implementation of a new curricular idea than schools without a shared vision (Rogan & Grayson, 2003).

Administrative Support

The participants in this study indicated that they had not received support from school administration with regards to incorporating Aboriginal perspectives. Their perception was slightly more negative than the teacher participants in Kanu's (2005) study of high school Manitoba teachers, who described school administrative support as lukewarm and inconsistent. However, no one suggested in this study that their administration might not be supportive if the participants asked. Both Jessica and Steve simply said they had not received any administrative support. Silvia and Rebecca both thought their administrators were unaware that Aboriginal perspectives were included in the program of study. Rebecca stated: "*I mean if I asked my administration about this I don't think that they would have a clue about what I was talking about*". Silvia echoed this by suggesting her administration was not oppositional they just did not have an: "*awareness that those* [Aboriginal perspectives] *are objectives that we are expected to meet*". This similar perception is particularly interesting as both Rebecca and Silvia teach at the same school. The differences in administrative support between the teachers in this study compared with Kanu's study may be related to how long Aboriginal perspectives have been included in the curriculum. In Manitoba, resources developed by the government to assist teachers in

implementing Aboriginal perspectives appeared in 2003 (Labelle & Manitoba Education and Youth, 2003) while, Alberta first included Aboriginal perspectives in their high school courses with Science 10 in 2005 (Alberta Education, 2005b). The number of people who identified themselves as Aboriginal was 15.5% in Manitoba compared with 5.8% in Alberta (Statistics Canada, 2006). Manitoba also had the highest proportion of self-identified Aboriginal people of all of the Canadian provinces in 2006, which may explain why there seems to be a greater awareness of Aboriginal perspectives inclusion in the curriculum compared with Alberta.

Amanda and John both thought their administration would be supportive if they pursued Aboriginal perspective integration versus other types of professional development but neither of them had inquired, therefore were unsure. Hank was slightly more optimistic about his administrative support when he returned from his sabbatical due to his positive relationship with the administration and his position in faculty council. He felt he had greater "*powers of persuasion*" than what a beginning teacher might have. Hank also thought it: "*would be an interesting question to ask me halfway through next year, to see how much support I had*" as Hank planned on asking for some support next year when he returned to teaching.

Brad was the only participant who felt there was specific administrative support available. He described that at his school, a specific administrator was assigned to Aboriginal support within the school although he could not identify any support specific to science education. Brad described the support from the

administrators as being focused on the students but without question felt his administration would be supportive if he wanted to pursue something related to Aboriginal perspectives integration.

Shared Vision

Rebecca was the only participant who spoke about the other people in her school having any involvement in incorporating Aboriginal perspectives. In attempting to find an Aboriginal person to come and speak with students on Earth day about traditional ecological knowledge and land use, Rebecca ran into difficulties in not being able to contact anyone. She recruited the help of her schools teacher-librarian, who made numerous phone calls and inquiries to try and find someone. Unable to find an Aboriginal speaker, Rebecca stood up at a school staff meeting and asked the entire staff of approximately 100 teachers if they knew of anyone who would be able to help them and no one approached her or spoke with her. Although Rebecca and the teacher-librarian at the school were quite dedicated to finding someone to speak to the students, the remainder of the school did not appear, at least to Rebecca, to support the vision of incorporating Aboriginal perspectives. The lack of a school culture which supported Aboriginal perspectives integration was identified by the teachers in Kanu's (2005) study as one of the reasons for the difficulty in incorporating Aboriginal perspectives.

4.3 Outside Influences

4.3.1 Physical Resources

Physical resources may be included in both Capacity to Support Innovation or Outside Influences. When included in Outside Influences, the focus is on the development or acquisition of the resources, which may consist of books, apparatus or person contacts (Rogan & Grayson, 2003). The focus in Capacity to Support Innovation is on the use of such resources. The inclusion in Outside Influence was chosen so as not to repeat information but also because most of the participants described the acquisition or development of the resources as opposed to the use of the resources.

Internet

Silvia, Rebecca and Brad all described their use of the Internet as a primary resource with varying degrees of success. Silvia has attempted to find resources via the Internet with limited success. Rebecca felt in many ways when attempting to find resources she was "*winging it*" but she used the Internet as a resource for herself as well as encouraging her students to use the Internet when researching for projects incorporating Aboriginal perspectives. Brad identified very specific resources he used from the Internet (see table 2 for a list of websites mentioned by the participants) including: "*the Alberta Ed site definitely has a number of resources that I've looked at that give Aboriginal perspective and lesson plan ideas from LearnAlberta*", although he also indicated that he probably had not incorporated an Aboriginal perspective into a lesson unless the reference to an Aboriginal perspective in a resource was overtly stated.

Table 2

Website Addresses Referenced by Teacher Participants

Reference	Website
Alberta Education	www.education.alberta.ca
Government of Alberta	www.alberta.ca
Google	www.google.ca
LearnAlberta	www.learnalberta.ca
Wikipedia	www.wikipedia.com

Several participants indicated that they had not incorporated an Aboriginal perspective but if they were going to plan a lesson with Aboriginal perspectives they would first go to the Internet. For example, Jessica specified that if she had to plan a lesson with taxonomy her first source of information would be the Internet, where she would attempt to find a reputable source on how Aboriginal people classified plants and animals. Jessica also indicated that she would search the Government of Alberta website in an attempt to find information pertaining to things like plants, animals, general beliefs and religion. Amanda suggested her first source would also be the Internet and that: "*it would have to be a Google search initially and whatever was second after Wikipedia was probably what I would use. I'm not going to lie to you*".

Person Contact

Hank and Rebecca had both attempted to utilize the expertise of an Aboriginal person while planning lessons with Aboriginal perspectives. Hank had planned a field study as part of a mandatory component of the Biology 20 course:

> *I had really hoped to have a native elder meet us at Elk Island National Park to talk about the importance of that area for his people. And I was in contact with that person through e-mail and it looked like it was going to work and we were going to meet him out there and I was very excited about that. But the day before, he cancelled. And so I had actually put a lot of my eggs in that basket to have someone else talk about what the perspective was with the taxonomy of that area and the importance*. (Hank)

Even though Hank was unsuccessful in getting someone to come out to speak with the class, he still indicated that he would like to have an Aboriginal elder come out to his class. More specifically, Hank referenced back to his original field trip plan and still wanted to pursue his original intent, which was to have an elder talk about the importance of the local area to Aboriginal people.

Rebecca had also attempted to incorporate an Aboriginal perspective by inviting an Aboriginal speaker into the class which was discussed earlier in reference to the apparent lack of a shared vision at her school. Although she was unable to get an Aboriginal speaker, a group from Amnesty International did come to the school as Rebecca describes: "*these four white people came out and did a presentation on, it was, it was not on land use it was on land rights*". She acknowledges that the group from Amnesty International group did a good job, however their presentation was not on the topic she was hoping and they were not Aboriginal.

Other participants shared their desire to have Aboriginal speakers come into their classes. For example, Amanda suggested: "*it might be neat to have like an actual person resource. So, like a guest speaker come in because again I feel very inadequate and I feel like kind of a jack ass if I'm honesty up there pretending to know where they're coming from*". She supposed that ideally you wouldn't need to have an Aboriginal person come in and speak about these issues but that initially a person contact would be great.

Textbook

The participants had various opinions on the use of the approved textbooks as an appropriate resource when attempting to incorporate Aboriginal perspectives. Brad and Rebecca had both used the *Inquiry into Biology* (Constantin, Colbourne, Dobell, Fehres, MacFadyen, Thomson, Mason, & Venter, 2007) text, as a reference. Not necessarily as a primary resource, but they certainly referenced the text when discussing Aboriginal perspectives. Brad indicated that there are: "*some official curricula resources that come from Alberta education now that do have the FNMI perspective. I use the McGraw-Hill biology textbook and there's definitely references to Aboriginal perspective. There's that sensitivity to those links*".

When asked what sources Steve referred to while planning lessons which included Aboriginal perspectives, he stated: "*mostly just the text resources*". Steve also felt: "*that the material available in the text is certainly good enough for what, it's certainly good enough for, for what I use if for in teaching the course*". Other than potentially discussing things Steve had heard on the news, he

only suggested the textbook as a resource for planning, which may be associated with his point of view that an Aboriginal perspective is really just a historical or traditional perspective.

Hank, Silvia and Roger all discussed the limitations of the textbook as a resource. Hank referred to the rigid nature of textbooks:

> *And textbooks themselves. I think, obviously, there's going to be some examples in the textbook, but like any example in a science textbook, I always find they're so static. They don't move. So if we were to come across, and honestly I haven't really used the new textbooks very much at all, so I haven't really spent a lot of time reading through them. But if you came across an example, rather than just say, "Here's an example of Aboriginal knowledge. Done," and say we've met that guideline in the program of studies because we have, you know, we've talked about the contribution, so lets move on. Right?* (Hank)

Silvia echoes this statement by Hank by discussing the tokenism towards Aboriginal perspectives she feels is presented in the textbooks:

> *I'm not happy with what's provided in our textbook resources at this point. Again a picture of an Eskimo doing something in the snow is not only just a token that's also stereotypical and it doesn't really get out what's important*. (Silvia)

Roger has been involved in the development of textbooks for the Alberta Biology 20-30 curriculum (Alberta Education, 2007). I did not initially set out to interview people who were involved in the development of resources. However, I

had the unique opportunity to interview Roger who has extensive experience in Biology education, therefore I took the time to discuss his thoughts on how Aboriginal perspectives have been included in textbooks. By no means does this represent all textbook authors or publishers opinions, simply Roger's perspective as someone who has gone through the textbook development process. Roger discussed how he felt textbook writing had become:

> *highly prescriptive because the diploma exam became the program of studies, not the program of studies. So to counter that, they made the program of studies highly prescriptive, doing a submission* [of writing for a textbook] *means checking off each of the learner outcomes .... So they will infuse things like one of the things you're studying, which is there Aboriginal knowledge present? But it becomes a list, a compendium, rather than it's worked in with some purpose and some meaning like snow ecology was. Because of course, the words are Inuit words. It was a science that was learned from people who were on trap lines, from people who took sort of experiential knowledge and formalized it later into scientific knowledge, but it was really experiential. So it was a look at that and how it influences, but we -- it was there, we just didn't have all of the, the names connecting it and showing how it happened. Now they've gone to the other, which is these are the things that are in there. See, here's our list. It proves that we've paid attention to Aboriginal education, which I think is backwards*. (Roger)

Although Roger alludes to the tokenism that Silvia had felt was present in the textbooks, he does see an optimistic side to things:

> *And so the fact that people are at least asking the question is a really important beginning. The fact that publishers are paying some attention, and even if they're rather silly things sometimes that are included as an Aboriginal example, at least they're looking for positive examples. And they're looking for ways of connecting with many different children. And I think that's positive*. (Roger)

Other Resources

The participants in this study identified a variety of other resources that they had either used or had access to. Rebecca and Silvia had taken a graduate course in Ethnobiology and identified resources provided from the course, such as textbooks, research papers and class discussions, as being valuable in teaching their own courses. Rebecca had also used her schools library, including print and Internet searches with her class on projects designed to integrate an Aboriginal perspective. Steve incorporated items he saw on the news and Hank made reference to literature he found valuable for ecology. He spoke of a book titled *Ishmael* (Quinn, 1992), which discusses the idea of taker cultures and leaver cultures. Hank identified with:

> *modern society has become takers. We take from the earth, We take, take, take. And we've progressed very quickly because of that. On the other hand, there are cultures on this planet that are still leaver cultures, but Daniel Quinn's argument is that we're ignoring those cultures*. (Hank)

Hank uses this literature to initiate discussions with his students about sustainability and how leaver cultures, which he equates with Aboriginal people, may have different solutions to the problem of depleting environmental resources.

As far as other types of resources that these participants would like to see, Amanda thought having an actual lesson plan would be good, while Jessica thought literature on how to lesson plan with Aboriginal content would be valuable. Rebecca, however, was hesitant about prescribed lesson plans and worksheets as: "*worksheets don't do it for*" her.

4.3.2 Professional Development

Rogan and Grayson (2003) describe professional development as "perhaps the most visible and obvious way in which outside agencies attempt to bring about changes in schools" (p. 1192). Professional development includes two components: the underlying purpose or focus and the extent and duration of the professional development. The participants in this study also identified factors surrounding availability and types of professional development.

Purpose and Focus

The teachers in this study expressed different opinions about the purpose and focus of the professional development opportunities they would like to see. Jessica was concerned with making sure that: "*we understood it* [Aboriginal perspectives] *enough to portray it correctly because stereotypically it could, I could see create some cultural tension if was done incorrectly*". Jessica was looking for professional development which would help make sure that when she implemented Aboriginal perspectives in her class "*it's done properly*". Silvia

expressed concern with having to decide what to include and what not to include. Silvia stated: "*I don't know what it's supposed to mean for our kids" and "I don't feel qualified to decide what's important and what isn't*". Silvia would like to know how teachers are supposed to be including Aboriginal perspectives into the curriculum:

> *I mean if we're using it to separate science from Aboriginal perspectives it does help the agenda of science but then it makes Aboriginal knowledge or you know traditional knowledge appear to be less than it should. So I worry about that as well. I mean you don't want to undermine or devalue those perspectives*. (Silvia)

Clarification on what exactly the program of studies means by Aboriginal perspective was a common theme expressed by all participants, particularly when discussing the appropriateness of including Aboriginal perspectives into the Biology curriculum.

Hank discussed how consultants had come out to his school to talk about Aboriginal perspectives:

> *Its been very generic and its, again, been very cautious, which I think is reasonable because to say the caution lies in saying that there is no one Aboriginal perspective and you have to be mindful that there are distinct groups. But that doesn't help, necessarily, with the science teacher who has to -- who's charged with teaching an Aboriginal perspective, to say that, "But there are multiple perspectives," you know? So what are they? Can you help me out here?* (Hank)

Brad reiterates this statement in discussions with consultants from his school district:

> *I sometimes wonder if in the first ten years of education, you're just trying to survive anyway, so. But there's definitely been a promotion and awareness from our district and consultants can be brought out and I have talked to our Aboriginal consultant in terms of, you know, just even perspectives. I don't know so much about specifics as to things that I could be doing in lessons by just overall perspectives of what's worked, maybe what hasn't worked, and the fact that there are resources there.* (Brad)

This suggests that perhaps the focus on professional development needs to be more concrete in giving teachers a starting point in incorporating Aboriginal perspectives. This is consistent with an extensive study investigating teacher professional development by Garet, Porter, Desimone, Birman and Yoon (2001), who indicated that enhanced teaching practice arose from professional development which focused on content knowledge, inquiry-orientated learning and high degrees of coherence with standards in the teachers school context.

Extent and Duration

The majority of the participants did not specifically discuss the extent or duration of support they would like with regards to Aboriginal perspectives integration. Silvia and Rebecca, both felt the Ethnobiology graduate course was incredibly valuable in helping them to develop greater awareness of Aboriginal perspectives. Silvia had attempted to incorporate Aboriginal perspectives into a

lesson on classification and felt: "*had I not taken that course I probably wouldn't have done any of it and I wouldn't have had access to the resources*". Rebecca felt the Ethnobiology course was so successful that she had attempted to take another graduate course related to Aboriginal perspectives, however, it did not fit in her program so did not take the course.

Rebecca was the only participant who indicated she would like to see any sort of time period with respect to Aboriginal perspectives integration, specifically, a: "*three day thing by an Aboriginal person*". Other participants suggested sessions at teacher's conference or science conference, which typically last from an hour to at most two days. However, none of the other teachers made precise reference to time. It is interesting to note that many participants suggested sessions at teacher' conferences while Fullan (1993) points out, "it has long been known that expertise is central to successful change, so its surprising how little attention we pay to it beyond one-shot workshops and disconnected training" (p. 13).

Availability

Several teachers indicated they had not received or pursued any professional development with regards to Aboriginal perspectives. Amanda, Steve and Rebecca all stated that they received no professional development. Jessica expanded slightly and when asked whether she had received any professional development, said: "*No and I have been looking*". When probed further, she had looked at sessions advertised by the school division sent via email but had not pursued anything else.

Hank replied that he had not received any professional development but had pursued some through the ATA (Alberta Teacher's Association) science conference. Regarding this session at the ATA science conference and some district professional development, Hank stated:

> *And so I haven't -- I guess I haven't actively sought professional development. I've come across it. At the district level, we've had an Aboriginal speaker talk about the experiences he's had with students in his own schools and his own experience and what kinds of things to look for.* (Hank)

Silvia had also pursued professional development, but had been more active in her pursuit. She described a session she attended:

> *The last Edmonton Biology/Chemistry Regional's day there was a number of sessions on Aboriginal perspectives and so I attended two sessions related to Aboriginal chemistry and again I was really, I was disappointed. The session was advertised as a three-act play Aboriginal chemistry and so I was hoping, you'd know to be very rich in the oral tradition and basically it was a PowerPoint that showed a bunch of different clay pots with different colors of paint*. (Silvia)

Silvia was looking for something more meaningful than examples and felt disappointed when she did not receive anything substantial from the sessions. Although Silvia had pursued some professional development, she also indicated:

> *There has been a few professional developments through the ERLC* [Edmonton Regional Learning Consortium]*, I think one or two. I haven't*

> *attended. So, I think there's been some support available, I haven't had the opportunity to engage with that*. (Silvia)

Type of Professional Development

The teachers in this study described a variety of types of professional development that they would like to have access to. Silvia wanted to: "*have the opportunity to talk to other teachers to really try and understand what this is supposed to mean for students*". She also felt that she: "*would like to know from the Aboriginal community what they feel is important*". Silvia really felt that: "*we need to have those conversations first* [with teachers and the Aboriginal community] *and then work towards deciding what kinds of things are appropriate to integrate in the classroom*".

John indicated he:

> *would like to see something kind of neatly packaged, specifically by curriculum people. I mean they've put this as sort of a general thing to do and you know be nice to develop an understanding and acknowledgement of, of Aboriginal contributions. But I'd like them to say here's specifically what were referring to ad this is where you could work it in. In other words, make life easier for me*. (John)

Amanda also suggested that: "*if someone would give me the actual lesson plan with all of the information in it that would … be good*". Brad was also interested in professional development that was targeted specifically to Biology. For example, when asked about what type of professional development Brad would be interested in, he replied:

> *You know, more specific in-servicing to subject area. So okay, I want to teach a Biology 30 lesson on endocrine system, so how can I incorporate Aboriginal perspective into that because on the surface it seems very much, physiology, diagram, terminology, and so on. So how is it -- how can I take a lesson like that? Or does it even work? Maybe I should be looking somewhere else?* (Brad)

Hank and Jessica both suggested sessions at teacher's conferences or the ATA science conference would be an excellent start in attempting to incorporate Aboriginal perspectives. Jessica:

> *would love to attend a session either at teacher's convention or science conference or an outside professional development where Aboriginal elders were brought in to speak with a group of teachers to explain how they think this could be done in a positive, inclusive manner*. (Jessica)

Hank agreed with Jessica's sentiment and suggested that:

> *if we're looking at really becoming serious about incorporating any perspective, whatever it is, there has to be the opportunity made at teacher conferences, at -- so that would be the ATA science conference, which I think is beginning, the teacher's conventions that teachers go to. I think that those sessions have to be available. And I think a lot of teachers will go to them because I think, at least in my own experience, I find there's a lot of sessions that don't have direct relevance to me as a science teacher.* (Hank)

4.3.3 Change Forces

Change forces refer to the types of forces that organizations use to bring about change (Rogan & Grayson, 2003). This can be described as the differences between pressure and support. None of the participants in this study felt a great deal of support for Aboriginal perspective integration. However, they all identified different types of applied pressure to the movement to include Aboriginal perspectives in the curriculum.

Governmental Pressure

The vast majority of the participants thought that the pressure to include Aboriginal perspectives came from some level of government. Interestingly, the participants who mentioned the government also included pressure as opposed to support. Silvia believed that the incorporation of Aboriginal perspectives was included as a: "*sort of a political making calming the waves*" and because:

> *there's a growing segment of the population and it's a segment of the population that's been oppressed in schools badly and I think that is integrating Aboriginal perspectives is partly a way of making up for prior discretions against a groups of people that is growing and becoming stronger.* (Silvia)

Brad agreed with the sentiment that the government was looking at incorporating a perspective into education to rectify a perceived or real problem concerning Aboriginal populations. However, seemed to feel slightly more optimistic than Silvia. Brad suggested:

> *I would suspect that it comes from levels of government, but there had to be an impetus to push for that. So, I mean, the recognition that, Aboriginal completion rates in terms of schooling wasn't as high as desired, as so I think the idea that if it could be more meaningful, if it could be more cognizant of Aboriginal perspective, then that would help promote things like that, success, interest, completion for the Aboriginal people*. (Brad)

Steve believed that incorporating Aboriginal perspectives in the curriculum is: "*probably as much a political rationale as any particular pedagogical argument*". John suggested that the incorporation was: "*because it's an Alberta government document and Alberta government needs to be help responsible for representing all segments of society*". John also thought:

> *Not sure. This is just taking a guess at it, but I don't see any specific mention of other cultures, so to me that sort of has a political agenda to it. Not saying that it's bad, just to me, that's what it feels like*. (John)

Hank also suggested that including Aboriginal perspectives was included because it was a politically sensitive thing to do. He suggested:

> *I guess I'm thinking about all the people that might impact curriculum and do teachers impact curriculum? And then they do. Do scientists impact curriculum? And they do. And industry impacts curriculum. And it does. But this issue, in my own personal sense, I don't think probably came from a lot of teachers who said, "We need this." I don't think it came from a lot of scientists who said, "You know, what we really need to prepare students*

> *for science in university is aboriginal perspectives," because that--obviously I'm being facetious because I think that they would for the most part argue that why are you doing this*. (Hank)

Hank also felt as though the government was applying pressure because of the poor performance of Aboriginal students. He goes on to say:

> *And in terms of educational policy, when you see Aboriginal students doing very poorly, well then you've got to somehow rectify that situation. So the government and Alberta Education probably has to say, "Okay, if we do this, we might make these students feel more comfortable in the classroom. They'll stay in school and do this." So there's that aspect to it. I can't--I shouldn't discredit the fact that there are educators that want to make sure that certain groups of students do well, but I still think it's probably more of a governmental decision. Right?* (Hank)

Amanda felt as though: "*there's a governmental pressure from an outside agency that was set up to take a look at First Nations issues and that's where it probably came from*". When asked who she thought this outside agency was made up of she hoped it would be First Nations and Aboriginal people, but: "*being a little cynical, my guess is it's probably people that on their resume can put that they have some sort of Aboriginal background*".

Roger's perspective included both government and society at large. When asked why he thought Aboriginal perspectives have been included in the program of study he replied:

> *So I think in Alberta it's--they've come to recognize that, this is something we better acknowledge. This is a significant part of our province and these are people within our province that have felt excluded or marginalized and it's not that they want to be good people always. They see a purpose in having those people brought into your larger group. But when you bring them in, you have to--you can't just throw out what they have. You have to include some of it, so I think that's why it's being done. I don't think it's devious. I think it's good, but I think there are a lot of motivations that don't come from, some of the conventional ways that we might think. It's not all altruistic*. (Roger)

The "we" that Roger kept alluding to in his response was the government. However, Roger continued by saying:

> *I think government's a reflection of a bigger group, which is society. And I think there's a greater recognition on the part of people that we've got to do something to change the way thing have been and the way things should be*. (Roger)

Societal Pressure

Rebecca discussed the potential affect that Western society has on Aboriginal perspectives and vice versa. She thought that Aboriginal perspectives had been included in the program of studies for the following:

> *Well I guess I'm starting to realize that it might be incorporated because of somebody out there is thinking that these people are not well represented in our science society and that there's stereotypes that need to*

> *be, that need to be broached and that there is valuable* [Aboriginal] *knowledge there and I think Western medicine, Western science is just starting to realize the value of it. Just starting to scratch the surface of some of the values they have and some of the incorporation I like that, its incorporation of the of the more esoteric value systems with the science which is something we don't do very well as western white people but they do as part of their very existence it's just not different to them at all…. I realize somebody else must have realized that and thought that this is a way to help to attack those stereotypes and maybe get other people thinking more holistically*. (Rebecca)

Interestingly, Jessica thought that before Aboriginal perspectives could be effectively incorporated in the curriculum, a shift needs to be made in the way society thinks. This line of thinking was related to her background:

> *I think that there's a bit of a stereotype in particular coming from a school that did have a population of Native American or First Nations students, that the culture is somehow less worthy than ours and that would be a cultural and societal change that would need to shift before I think implementing this would be effective. And by implementing this that being said it might actually help to foster respect and cultural acceptance.* (Jessica)

Jessica acknowledges the shift in thinking that may need to happen prior to effective implementation. However, she also suggests that perhaps, implementing Aboriginal perspectives may help to shift societies views.

Aboriginal Community Pressure

Two of the participants suggested that perhaps the pressure to include Aboriginal perspectives might have come from Aboriginal groups. John suggested that: "*Aboriginal groups have, certain ones, not all, certain ones, have been very vocal in their political agendas*". Silvia also suggested that Aboriginal groups have possibly exerted pressure to include Aboriginal perspectives by suggesting: "*I would suspect that there were pressures from special interest groups, possibly Aboriginal special interest groups*". Neither of these participants could specify any particular Aboriginal group nor were they willing to suggest that pressure to include Aboriginal perspectives came solely from or even mostly from Aboriginal groups.

4.4 Profile of Implementation

4.4.1 Classroom Interaction

Classroom interaction describes all of the interactions that occur between the teacher and the students (Rogan & Grayson, 2003). As this research is focusing on how the teacher conceives of integrating Aboriginal perspectives, the types of interactions between teacher and student are from the perspective of the teacher and how the teacher perceived that interaction. The participants described what they perceived their students reactions were to discussions or lessons associated with Aboriginal perspectives.

Teacher Perceptions of Student Reactions

Only two participants in this study discussed their student's reactions to incorporating Aboriginal perspectives, which is not all that surprising given that the focus of the interviews was on how teachers perceive the integration. When Rebecca had asked her students to write research reports, which incorporated Aboriginal perspectives into a concept from Biology 30, she found her students reactions quite surprising:

> *The interesting thing was the reaction I got from the students. These are the best students in the school and as soon as I presented this they were absolutely indignant. There was no Aboriginal students in that class and they said, "well why don't we do the Swedish perspective or the German perspective because I'm German and I would like to do the German perspective on all these things not the Aboriginal perspective. Why are they more important than my background" and they kept up with it for quite a while and so I had to, I had to step back and the first time they did that I kind of dismissed it and then the next day I had to come back and say okay, let's talk about why we're doing this. Why it's in here. We were doing this because we have to, but we're also doing this because maybe we have something to learn from the way they were doing things. Maybe they lived on this planet for 2500 years before we got here and didn't wreck things and now were coming here with our European perspectives and things aren't going so good. So we had quite a discussion that day and although it was a good discussion they were not convinced by the time I*

> *was finished with them. They did what they were asked to do but I don't think I changed their minds. It was very interesting, these are high academic kids right. So that's why it sticks in my mind. You know because it's the first time I tried this and I got such a negative reaction…. They never lost that feeling of why do those people get special treatment in this course and I can't research my own culture*. (Rebecca)

Hank had a less severe reaction from his Biology 20 AP [advanced placement] students when he asked them to create stories from their field trip:

> *I think the students at first were quite frustrated because they didn't know how to do that and they didn't understand why I would want to do that. But once we got into it a bit, and because they were AP students--I mean, AP students can struggle sometimes academically too, but they're more serious about what you do in class as long as it seems you have a reason. So one of the worries I had was they'd be making fun of this, like "This isn't real science. This is silly. What are we doing this for?" Right? "You're just trying to kill time." But they generally took it seriously and they weren't really--it wasn't a humorous thing. They weren't making fun of telling myths or stories. They actually tried to develop something. But because they hadn't had practice, we were limited in how far we could get, but it's something I want to look at going back to in the future*. (Hank)

Hank and Rebecca were both very interested in attempting to incorporate Aboriginal perspectives into their teaching but received very different reactions from their students. Although both classes were composed of highly academic

students, Rebecca's school was located in a primarily Caucasian community, while Hank described his school as more multicultural. Rebecca described her community as being racially homogenous, possibly leading to: "*misunderstanding and stereotypes*".

4.4.2 Implementation Practical Work

Rogan and Grayson (2003) described practical work in terms of science as they were researching the implementation of a new science curriculum. As this research was looking at incorporating Aboriginal perspectives into Biology classes I focused on the descriptions of lessons incorporating Aboriginal perspectives into Biology lessons. Teacher demonstrating implies that the lesson is teacher driven and presented, as opposed to learner doing which implies a focus on the learner being actively engaged in some activity.

Teacher Demonstrating

Most of the participants in this study who had attempted or who would like to incorporate Aboriginal perspective into a lesson described teacher centered or teacher directed presentation as opposed to student centered activities. Silvia described her experience with incorporating an Aboriginal perspective as questionable in terms of success. Her interaction with the students in a lesson on nomenclature involved her spending:

> *a little bit of time telling the students about alternative naming systems for plants that Aboriginals might use and the kinds of characteristics that they might use to but them in categories to show how categorization is really fairly arbitrary*. (Silvia)

Silvia did not engage with the students beyond presenting information. Steve also presented Aboriginal perspectives in much the same way as Silvia. In describing how Steve had incorporated Aboriginal perspectives into lessons he would tell the students: "*this is the way they used to do thing and now this is the way we do them*". Again, like Silvia, Steve did not engage with the students other than to present them with information. Jessica had not incorporated Aboriginal perspectives into a lesson but did comment that if she were to try and incorporate Aboriginal perspectives she would do it in much the same way as Silvia and Steve had. Jessica described a possible lesson as follows:

> *I think it's important to present both ideas like present it both from a scientific perspective and as well from an Aboriginal perspective hoping to overlap them where you could. Once again as stated earlier I would try to compare and contrast, draw the similarities, the parallels to it and I think by doing it that way, rather than forcing kids to take a perspective, you're presenting it to them giving them the independence to choose for themselves and I think makes them more open-minded and able to think critically*. (Jessica)

Learner Doing

Rebecca and Hank had attempted to incorporate Aboriginal perspectives in a way that required students to engage more with the topic than the other participants. Rebecca had decided to do a mini unit with her Biology 30 International Baccalaureate class on Aboriginal perspectives. She told the class:

> *You're all going to look through the curriculum, you're going to find someplace you think you can fit this in and of course it's mentioned a few times in the curriculum, and so I used those as suggestions as to where it would more easily it in. For example in the nervous system and maybe poison arrows or something like that and so we went to the library and everyone researched an Aboriginal perspective and did a little report on how Aboriginal perspectives related to what they had learnt in Biology 30 kind of at the end, kind of like a capping project, which ended up working out okay*. (Rebecca)

She described the student's reports as great but felt like the students never really engaged with the project, even though she had tried to make them see the rationale for incorporating Aboriginal perspectives.

Hank had unsuccessfully tried to invite an Aboriginal person to come speak with the class while on a field trip to a local national park. When the speaker cancelled, Hank still attempted to do something to have the students connect with an Aboriginal perspective:

> *I tried to have the students develop a story of something they saw that day. So just sat around after the field trip and told each other stories because I think that's a very important consideration in terms of a type of knowing, right, is to tell stories about what you've seen*. (Hank)

Hank had also attempted to start discussions with students in class:

> *There's that idealistic notion that Aboriginal people were these perfect ecological stewards, which--and again, you could get in that argument of*

> *traditional idealism versus, you know, what would contemporary Aboriginal knowledge of ecology be? Would it be as conservative or would it be--if the population was as high as it is today, would that conservation have been the same? And so those are types of questions I sometimes throw out to students and it's--we have discussions about it. We never really reach a consensus, but, so that's how I've done it in the past*. (Hank)

Hank repeatedly mentioned the idea of getting students to talk about and discuss these issues and not to rely on examples from the text or his own, what he believed to be, lack of expertise.

4.4.3 Implementation in Society

In Rogan and Grayson's (2003) original framework, the focus for this theme was on science in society, which looked at whether teachers were simply making their students aware of science in society, possibly by describing examples, or were teachers engaging students in society, for example, developing modern irrigation systems in drought affected areas. Given the current research project I focused on implementing Aboriginal perspectives in society. Simple awareness in this context may include examples and brief mentioning of Aboriginal perspectives in a scientific context, to actively engaging students in societal issues and utilizing Aboriginal perspectives and scientific perspectives to solve problems.

Simple Awareness

Several participants described examples of how Aboriginal perspectives may be involved in society. However, they simply mentioned these examples to

their students. Steve used Aboriginal perspectives to illustrate: "*the way they used to do things and now this is the way we do them*". Silvia described alternative naming systems to her class. John mentioned: "*medicines and treatments of certain conditions that you know, natural, medicinal sorts of drugs, treatments but, you know, not to a large degree*".

Actively Engaging

Hank was the only participant who began the process of getting his students to think about using Aboriginal perspectives in the use of solving societal issues. He asked his students questions which had them think about the: "*idealistic notion that Aboriginal people were these perfect ecological stewards*". In addition, Hank engaged in discussions related to: "*what would contemporary Aboriginal knowledge of ecology be? Would it be as conservative … if the population was as high as it is today, would that conservation be the same*"?

Roger expressed his concern that the connections being made between Aboriginal perspectives, science and society are not substantial:

> *I think Alberta education, and I mean, those people are my friends. I'm not being critical of 'em, but they think the more examples you have, the better. That's only one part of the formula. It's--it is important to have some knowledge to draw on, but what do you do with it? What does it mean to infuse Aboriginal knowledge into the curriculum rather than talk about it as, "Well, here's an Aboriginal student that is a science winner." Well, yeah, okay. It's okay to do that, but we shouldn't be surprised in five or six years that they're winning national science fairs. We should have*

> *something more substantive to make connections with. In other words, they're saying, "It's okay to be good in science and be an Aboriginal student." I get that. But come on.* (Roger)

Roger suggested that more needed to be done than simply acknowledging some contributions of Aboriginal people in society and that students required more connections to develop any meaning from an Aboriginal perspective.

Chapter Five

Conclusions and Recommendations

The original research question guiding this investigation was:

How do non-Aboriginal teachers of Biology, conceive of incorporating Aboriginal perspectives into their teaching of the Alberta Biology curriculum?

Three subsidiary questions developed as a result to guide the main question:

I. How do teachers incorporate Aboriginal perspectives in their teaching?

II. What value do teachers see in incorporating Aboriginal perspectives?

III. What supports do teachers utilize or have access to and what resources would teachers like access to while preparing lessons which incorporate Aboriginal perspectives?

From these three subsidiary questions, interview questions were designed to probe non-Aboriginal Biology teachers perceptions related to Aboriginal perspectives integration. As this study was exploratory in nature, the extent to which outcomes can be generalized is limited. The information gained through this study can, however, be used to inform further research and to help inform policy makers and curriculum developers. Conclusions, limits of the study and further considerations are framed in terms of the three subsidiary questions.

5.1 How do teachers incorporate Aboriginal perspectives in their teaching?

For the most part, teachers in this study were not incorporating Aboriginal perspectives into their teaching in a way they felt was meaningful. Some of the participants indicated they provided examples of Aboriginal perspectives but these were also identified as Aboriginal content pieces. This is consistent with what Aikenhead and Huntley (1999) concluded in their study of teacher views on Aboriginal students learning science.

The teachers were following what Banks (2004) describes as the second level or additive approach. This is when the structure of the curriculum is not changed but the addition of content or perspectives is added, in the form of a unit or books. The only person who indicated a real attempt to incorporate more than an additive approach was Hank who demonstrated what Banks would describe as the third level or the transformation approach. This is when "students view concepts, issues, themes, and problems from several ethnic perspectives and points of view" (Banks, 2004, p. 250). When engaging his students in discussions related to sustainability, Hank had the students look at the issue from a Western scientific view, a traditional perspective and a contemporary Aboriginal perspective. Just as in Kanu's (2005) investigation, the teachers in this study did not employ Banks final level: the social action approach. The social action approach includes the students making decisions related to real-world issues or problems with the possibility of enacting those decisions. None of the teachers were asking students to make decisions or enact them. Hank had discussions related to social issues and looked at various perspectives but he did say his

students never really came to any decisions and they never pursued anything beyond a classroom discussion. One limitation of this study is that the data generated is from the teacher's own perceptions and thus there may be inconsistencies between their perceptions and reality. Observation of teaching and/or examination of lesson plans would have provided further evidence of the realities of the classroom. Further consideration also needs to be given to the degree to which teachers are incorporating Aboriginal perspectives. Rogan (2007), Rogan and Aldous (2005) and Rogan and Grayson (2003) have developed a rating scale associated with each of the constructs in their framework which could be used to frame questions for and observations of teachers in the classroom and thus determine a scale of implementation of Aboriginal perspectives in Biology.

This study has identified a great need for further support in curriculum implementation of Aboriginal perspective and it is likely that this need will be manifested in a wider population. However, to confirm this it would be helpful to conduct larger scale studies. For example, a survey could be distributed to a larger sample of non-Aboriginal Biology teachers. It would be particularly interesting to determine the extent to which teachers were implementing Aboriginal perspectives, as there are implications if teachers do not follow the programs of study. For a teacher to hold either an interim or permanent teaching certificate in Alberta, they must "translate curriculum content and objectives into meaningful learning activities" (Alberta Education, 1997), which include using strategies to "achieve desired outcomes, primarily the expectations outlined in the

Guide to Education, programs of study and other approved programs" (Alberta Education, 1997). Failure to do so may lead to a charge of unprofessional conduct due to incompetence. Additionally, it would be interesting to see whether the lack of questions pertaining to Aboriginal perspectives on the diploma exams factor into teachers decisions on including Aboriginal perspectives or not.

Hank and Rebecca in particular, had made serious attempts to incorporate Aboriginal perspectives as opposed to Aboriginal content. However both experienced a variety of difficulties ranging from inability to access elders, negative student reaction, lack of material resources and an inadequate knowledge base. From the conceptual framework, factors such as unclear or varying definitions of Aboriginal and Aboriginal perspectives by teachers, a lack of education and workplace training and a lack of confidence in teaching an Aboriginal perspective were identified as teacher factors which may hinder the implementation of Aboriginal perspectives for these teachers. All of the participants with the exception of Steve, Hank and Roger expressed uneasiness with integrating Aboriginal perspectives. This may be because these three identified exceptions to the teacher factors which may have supported their efforts to incorporate Aboriginal perspectives.

The teachers in this study indicated a willingness to try and incorporate an Aboriginal perspective, however in their opinion they were not being overly successful. This is similar to a finding by Aikenhead and Huntley (1999) who describe teachers expressing "openness to include Aboriginal knowledge in the science program … but in practice little or moderate headway is being made

except for in a few unique instances" (p.167). Aikenhead and Huntley were investigating Aboriginal and non-Aboriginal teachers views on Aboriginal students learning science. What is of particular interest in this study is that the non-Aboriginal teachers all taught in schools with low Aboriginal student populations and they still indicated openness to teaching Aboriginal perspective in Biology. Several participants suggested this was because the content matter that they associated with Aboriginal perspectives was biological or ecological and thus was relevant to their specialist background and teaching experience.

5.2 What value do teachers see in incorporating Aboriginal perspectives?

The majority of the participants in this study saw value in incorporating Aboriginal perspectives but for different reasons. Some felt that there was value in incorporating Aboriginal perspectives in Biology due to the content matter. Jessica valued Aboriginal perspectives because she thought that a more holistic viewpoint was tied with the idea of Earth being an ecosystem. Silvia thought Aboriginal perspectives were:

> *related to Biology in the sense that, Aboriginal perspectives is a fairly natural and probably effective way to describe nature of science as opposed to other knowledge systems and its related to biology because of the content matter is usually biological*. (Silvia)

Hank values an Aboriginal perspective because he believes: "*there's a space in Biology to say, "Let's look at other perspectives". Like let's look at a traditional Aboriginal way of thinking*". Hank also believes:

> *Biology has a really good place for bringing perspective, alternate perspectives in. And I think Biology always has because it's been based on stories and seeing things happen rather than, making theoretical predictions and then working toward solving problems. But we're at the point now where we're creating problems, biological problems. And do we have to start taking in different perspectives. And so maybe thinking of other people's theories about how things work would be useful.* (Hank)

Rebecca saw incorporating Aboriginal perspectives in all curriculum as a great way to combat stereotypes and misunderstanding associated with Aboriginal people, while Amanda and Brad both thought it would expose students to more than one way of knowing in science. The only participant who did not see value in incorporating Aboriginal perspectives was John due to his teaching context. John taught a split class of Biology 20-30 in summer school and felt as though there was too much content to get through therefore he eliminated anything the students would not be directly tested on, including Aboriginal perspectives. Again, even though the majority of the teachers in this investigation saw the incorporation of Aboriginal perspectives as valuable, most were not actively pursuing the inclusion in their lessons. Further consideration needs to be given into why, even when teachers see incorporating Aboriginal perspectives into the curriculum as valuable, they do not make more attempts to include it.

5.3 What supports do teachers utilize or have access to and what resources would teachers like access to while preparing lessons which incorporate Aboriginal perspectives?

The participants in this study identified a number of different resources that they had access to. However, for the most part the participants did not express having extensive use of any of them, which was highlighted by Rebecca who stated she felt as though she was "*winging it*" when accessing resources. The most identified resource that participants indicated having access to was the Internet, including the Government of Alberta, Alberta Education, LearnAlberta, Google, and Wikipedia websites. Other resources participants described having access to were, elders, divisional consultants, course material from graduate courses, and the textbook. The participants also described limited professional development opportunities and those that were attended were reported as being not very informative and disappointing.

The participants did not find difficulty in identifying the types of resources that they would like to have access to. The participants repeatedly described different professional development opportunities they wish they had access to, including sessions at teacher's conferences, sessions at ATA Science council conference, three-day workshops and graduate courses. Of most value would be clarification on what exactly the Biology 20-30 program of study (Alberta Education, 2007) means by Aboriginal perspective as the participants in this study had difficulty ascertaining the definition from this document. Alberta Education (2005a) has developed a document which does define Aboriginal and Aboriginal

perspectives. However, this resource is neither a required or recommended resource for Biology and none of the teachers had utilized it. Many participants indicated they would like professional development that helped to clarify what teachers should do when attempting to incorporate Aboriginal perspectives and it should be targeted to Biology, something they had yet to find. The teachers in this study also described a variety of resources they would like access to such as elder contacts, Internet resources, worksheets, lesson plans and proper support.

In this study participants simply described resources they thought they might like. Further work could include giving participants the opportunity to interact with relevant resources, try them in their classroom and provide feedback on their value. Further consideration needs to be made in assessing the value of particular resources and to identify where and how teachers are accessing resources.

5.4 Further Questions/Investigations

This study has highlighted questions to guide further investigations:

1. To what degree are non-Aboriginal Biology teachers incorporating Aboriginal perspectives into the curriculum? Is this different when the teachers are Aboriginal?
2. For those teachers who indicate Aboriginal perspectives are important, why or why don't they incorporate them into their delivery of the curriculum?

3. What resources and professional development opportunities are available to teachers in Alberta and Canada? To what extent are teachers accessing those resources and professional development opportunities?

It is also important to perform a large-scale study to improve the generalizability of the data. This study has identified some difficulties that these non-Aboriginal Biology teachers are facing when attempting to incorporate Aboriginal perspectives in the curriculum and it is important to determine whether these results apply to the general population.

5.5 Recommendations

This research has identified some common issues that are significant to the teachers and the students they teach. I propose the following general and Biology specific recommendations to Alberta Education:

1. Greater clarity is required on the definition of Aboriginal and Aboriginal perspectives as they relate to the Biology programs of study. This could be achieved through professional development opportunities or resources provided by curriculum writers with relevant expertise.
2. Greater support from government in the form of resources and professional development opportunities, which need to be specifically targeted to the Biology curriculum.
3. Contacts in the Aboriginal community that could help provide guest speakers, e.g., elders, would be a meaningful resource for teachers. Coordinating initial contact would be valuable.

4. A more extensive rationale on why Aboriginal perspectives have been included in Alberta programs of study and what this means for students needs to be provided. Understanding the purpose could help teachers enact curriculum implementation in a more focused way.

In addition, I propose the following recommendations for non-Aboriginal Biology teachers and school administrators:

1. Teachers need to actively pursue professional development and encourage sessions related to Aboriginal perspectives in Biology at teacher's convention and at ATA Science Council conference.
2. Teachers and students could engage collaboratively in the implementation of Aboriginal perspectives. Teachers do not need to be the expert all the time.
3. To help increase their knowledge, I recommend teachers read, *Our Words, Our Ways: Teaching First Nations, Métis and Inuit Learners* (Alberta Education, 2005). This resource provides information pertaining to general Aboriginal perspectives, as well a list of treaties and Métis settlements in Alberta. None of the teachers in this study had ever heard of this resource, most likely because it is not a required or even recommended resource for Biology.
4. Greater administrative support by helping to establish a consistent and shared school vision regarding Aboriginal perspectives integration.

Ultimately, the most significant recommendation is that research in the area of non-Aboriginal teachers incorporating Aboriginal perspectives in Alberta

curriculum must be continued. The participants clearly indicated issues and challenges associated with incorporating an Aboriginal perspective in teaching Biology. If Aboriginal perspectives integration is important to teachers, administrators, school divisions, Alberta Education, the Government of Alberta and other stakeholders then more investigation is needed to ensure that challenges can be addressed.

5.6 Personal Reflection

My journey through this process has been very interesting. I came to this topic because of a number of things. I am currently a non-Aboriginal Biology teacher teaching in a school with predominantly non-Aboriginal students. I have struggled with determining how to appropriately deliver an Aboriginal perspective in my Biology class and have my students derive meaning from it. I also teach a Knowledge and Employability class which has a much higher proportion of Aboriginal students. I never have had a problem admitting my lack of experience and truly enjoy learning from my students in this class. Why then do I struggle not being the expert in my Biology classes? This was what first brought me to this topic. I was hoping through this process that I would find some answers to help me to effectively teach Aboriginal perspectives in Biology and to help other teachers. However, what I found was that other teachers were experiencing the same struggle as myself and there does not appear to be any immediate solutions. What this process has done is motivate me to develop relevant resources and to engage in discussions at teacher's conventions and science conference. I truly

believe there needs to be a more open dialogue regarding these issues. In addition, I hope to continue investigating curriculum implementation and change, in particular, looking at how non-Aboriginal Biology teachers can make meaning of Aboriginal perspectives integration for their students and themselves.

References

Agrawal, A. (1995). Dismantling the divide between indigenous and scientific knowledge. *Development and Change. 26*, 413-439.

Aikenhead, G. (1996). Science education: Border crossing into the subculture of science. *Studies in Science Education, 27*(1), 1-52.

Aikenhead, G. (1997). Towards a First Nations cross-cultural science and technology curriculum. *Science Education, 81*(2), 217-238. doi: 10.1002/(SICI)1098-237X(199704)81:2<217::AID-SCE6>3.0.CO;2-

Aikenhead, G. (2001). Integrating western and aboriginal sciences: Cross-cultural science teaching. *Research in Science Education, 31*, 337-355.

Aikenhead, G. (2006). *Science education for everyday life: Evidence-based practice.* London, ON: Althouse Press.

Aikenhead, G., & Huntley, B. (1999). Teacher's views on aboriginal students learning western and aboriginal science. *Canadian Journal of Native Education, 23*(2), 159-175.

Alberta Education. (1997, May 14). *Teaching quality standard applicable to the provision of basic education in Alberta.* Retrieved July 2, 2010, from http://education.alberta.ca/department/policy/standards/teachqual.aspx

Alberta Education. (2005a). *Our words, our ways: Teaching First Nations, Métis and Inuit learners.* Edmonton, AB.

Alberta Education. (2005b). *Science 10 program of study.* Edmonton, AB.

Alberta Education. (2007). *Biology 20-30 program of study*. Edmonton, AB.

Alberta Education. (n.d.). http://www.education.alberta.ca/media/824183/curric_dev.pdf

Baker, D. (1996). Does 'indigenous science' really exist? *Australian Science Teachers' Journal, 42*(1), 18-20.

Balick, M., & Cox, P. (1999). *Plants, people and culture: The science of ethnobotony.* NY: Scientific American Library.

Banks, J. A. (2004). Approaches to multicultural curriculum reform. In J.A. Banks & C. A. McGee Banks (Eds.), *Multicultural education: Issues and perspectives* (pp. 242-264). Hoboken, NJ: John Wiley & Sons, Inc.

Berkes, F. (1993). Traditional ecological knowledge in perspective. In Inglis, J. (Ed.) *Traditional Ecological Knowledge: Concepts and Cases.* Ottawa: International Development Research Centre and International Program on Traditional Ecological Knowledge.

Berkes, F. (1999). *Sacred Ecology: Traditional Ecological Knowledge and Resource Management.* Philadelphia: Taylor and Francis.

Blackburn, S. (2008). *Oxford dictionary of philosophy.* New York, NY: Oxford University Press.

Butler, K. (2000). Overcoming Terra Nullius: Aboriginal perspectives in schools as a site of philosophical struggle. *Educational Philosophy and Theory, 32*(1), 93-101.

Canadian Charter of Rights and Freedoms. (1982). Retrieved from the Government of Canada, Department of Justice Canada website: http://laws.justice.gc.ca/en/charter/const_en.html#charte

Coalition for the Advancement of Aboriginal Studies (CAAS). (2002). *Learning about walking in beauty: placing aboriginal perspectives in Canadian classrooms.* Toronto, ON: Canadian Race Relations Foundation (CRRF).

Colburn, A. (2007). The prepared practitioner. *The Science Teacher, 74*(7), 10.

Constantin, R., Colbourne, H., Dobell, D., Fehres, C., MacFadyen, D., Thomson, G., Mason, A., & Venter, A. (2007). *Inquiry into biology.* Whitby, ON: McGraw-Hill Ryerson Ltd.

Creswell, J. W. (2009). *Research design: Qualitative, quantitative and mixed methods approaches.* Thousand Oaks, CA: Sage Publications, Inc.

den Heyer, K. (2009). Sticky points: teacher educators re-examine their practice in light of a new Alberta social studies program and its inclusion of aboriginal perspectives. *Teaching Education, 20*(4), 343-355. doi:10.1080/10476210903254083

Doig, L. A. (2003). A missing link: Between traditional aboriginal education and the western system of education. *Canadian Journal of Native Education, 27*(2), 144-160.

Driver, R., Asoko, H., Leach, J., Mortimer, E., & Scott, P. (1994). Constructing scientific knowledge in the classroom. *Educational Researcher, 23*(7), 5-12. Retrieved from http://www.jstor.org/stable/1176933

Ercikan, K., & Roth, W-M. (2006). What good is polarizing research into qualitative and quantitative? *Educational Researcher, 35*(5), 14-23. Retrieved from http://www.jstor.org/stable/3699783

Firestone, W.A. (1987). Meaning in method: The rhetoric of quantitative and qualitative research. *Educational Researcher, 16*(7), 16-21. Retrieved from http://www.jstor.org/stable/1174685

Fishman, B. J., & Krajcik, J. (2003). What does it mean to create sustainable science curriculum innovations? A commentary. *Science Education, 87*, 564-573. doi:10.1002/sec.10088

Fullan, M. (1993). Why teachers must become change agents. *Educational Leadership, 50*(6), 12-17.

Fullan, M. (2007). *The new meaning of educational change*. NY: Teachers College Press.

Fullan, M., Cuttress, C., & Kilcher, A. (2005). 8 forces for leaders of change. *Journal of Staff Development, 26*(4), 54-64.

Garet, M. S., Porter, A. C., Desimone, L., Birman, B. F., & Yoon, K. S. (2001). What makes professional development effective? Results from a national sample of teachers. *American Educational Research Journal, 38*(4), 915-945.

Gay, G. (2000). *Culturally responsive teaching: Theory, research and practice.* NY: Teachers College Press.

Gerring, J. (2007). *Case study research: Principles and practices.* NY: Cambridge University Press.

Giroux, H. (1992). *Border crossings: Cultural workers and the politics of education*. NY: Routledge.

Goulet, L. (2001). Two teachers of aboriginal students: Effective practice in sociohistorical realities. *Canadian Journal of Native Education, 25*(1), 68-82.

Groome, H. (1994). *Teaching aboriginal studies effectively.* Wentworth Fall: Social Science Press.

Hancock, D. R., & Algozzine, B. (2006). *Doing case study research: A practical guide for beginning researchers.* NY: Teachers College Press.

Johnson, R. B., & Onwuegbuzie, A. J. (2004). Mixed methods research: A research paradigm whose time has come. *Educational Researcher, 33*(7), 14-26. Retrieved from http://www.jstor.org/stable/3700093

Kanu, Y. (2005). Teacher's perceptions of the integration of aboriginal culture into the high school curriculum. *The Alberta Journal of Educational Research, 51*(1), 50-68.

Kawagley, A. O., Norris-Tull, D., & Norris-Tull, R. A. (1998). The indigenous worldview of Yupiaq culture: Its scientific nature and relevance to the practice and teaching of science. *Journal of Research in Science Teaching, 35*(2), 133-144.

Labelle, L., & Manitoba Education and Youth. (2003). *Integrating aboriginal perspectives into curricula: A resource for curriculum developers, teachers, and administrators.* Winnipeg, MB: Manitoba Education and Youth.

Ledoux, J. (2006). Integrating aboriginal perspectives into curricula: A literature review. *The Canadian Journal of Native Studies, 26*(2), 265-288.

Malcolm, C., Keane, M., Hoolo, L., Kgaka, M., & Owens, J. (2000). *Why some 'disadvantaged' schools succeed in mathematics and science: A study of 'feeder' schools*. Johannesburg: RADMASTE Centre, University of the Witwatersrand.

Milner, H. R. (2005). Developing a multicultural curriculum in a predominantly white teaching context: Lessons from an African American teacher in a suburban English classroom. *Curriculum Inquiry*, *35*(4), 391-427.

Nadasdy, P. (1999). The politics of TEK: Power and the "integration" of knowledge. *Arctic Anthropology, 36*, 1-18.

Ogawa, M. (1995). Science education in a multiscience perspective. *Science Education, 79*(5), 583-593. doi: 10.1002/sce.3730790507

O'Sullivan, M. C. (2002). Reform implementation and the realities within which teachers work: A Namibian case study. *Compare, 32*(2), 219-237. doi: 10.1080/03057920220143192

Pinto, R. (2005). Introducing curriculum innovations in science: Identifying teachers' transformations and the design of related teacher education. *Science Education, 89*, 1-12. doi:10.1002/sce.20039

Quinn, D. (1992). *Ishmael.* New York, NY: Bantum/Turner Book.

Rogan, J. M. (2007). An uncertain harvest: A case study of implementation of innovation. *Journal of Curriculum Studies, 39*(1), 97-121.

Rogan, J. M., & Aldous, C. (2005). Relationships between the constructs of a theory of curriculum implementation. *Journal of Research in Science Teaching, 42*(3), 313-336.

Rogan, J. M., & Grayson, D. J. (2003). Towards a theory of curriculum implementation with particular reference to science education in developing countries. *International Journal of Science Education, 25*(10), 1171-1204.

Smith, M. (2001). Relevant curricula and school knowledge: New horizons. In K.P. Binda & S. Calliou *Aboriginal Education in Canada: A Study in Decolonization* (pp.77-88*).* Mississauga, ON: Canadian Educators' Press.

Snively, G., & Corsiglia, J. (2001). Discovering Indigenous science: Implications for science education. *Science Education, 85*(1), 6-34. Doi: 10.1002/1098-237X(200101)85:1<6::AID-SEC3>3.3.CO;2-I

Snyder, J., Bolin, F., & Zumwalt, K. (1992). Curriculum implementation. In P. W. Jackson (Ed.), *Handbook of research on curriculum: A project of the American educational research association* (pp. 402-435). New York, NY: Macmillan Publishing Company.

Stake, R.E. (1995). *The art of case study research*. Thousand Oaks, CA: Sage Publications, Inc.

Statistics Canada. (2006). *Aboriginal identity population by age groups, median age and sex, 2006 counts, for Canada, provinces and territories.* Retrieved from http://www12.statcan.ca/english/census06/data/highlights/Aboriginal/pages/Page.cfm?Lang=E&Geo=PR&Code=01&Table=1&Data=Count&Sex=1&Age=1&StartRec=1&Sort=5&Display=Page

Taylor, J. (1995). Non-Native teachers teaching in Native communities. In M. Battiste (Ed.), *First Nations education in Canada: The circle unfolds* (pp. 224-242). Retrieved from http://site.ebrary.com.login.ezproxy.library.ualberta.ca/lib/ualberta/docDetail.action?docID=10134773

Watson, G., & Goulet, J.G.A. (1992). Gold in; gold out: The objectification of Dene Tha accounts of dreams and visions. *Journal of Anthropological Research. 48*, 215-230.

Witt, N. W. (2006). Not just adding aboriginal contents to a non-aboriginal curriculum: Preparing Saskatchewan teachers for the rising aboriginal school population. *International Journal of Learning, 12*(10), 347-359.

Wotherspoon, T. (2007). Teaching for equity? What teachers say about their work in aboriginal communities. *Education Canada, 47*(4), 64-68.

Yin, R. K. (2009). *Case study research: Design and methods.* Thousand Oaks, CA: Sage Publications, Inc.

Appendix A

UNIVERSITY OF ALBERTA

Integrating Aboriginal Perspectives
Information Letter for Interview Participants

April 5, 2010

Dear Participant,

You are invited to participate in a research study which explores Biology teachers' views on the incorporation of Aboriginal perspectives in their delivery of the Alberta Biology curriculum. The title of the study is "Integrating Aboriginal Perspectives: Issues and Challenges Faced by Biology Teachers." The research is being done by Tracy Blood, a graduate student at the University of Alberta.

The purpose of this study is to investigate how teachers of Biology in Alberta conceive of incorporating Aboriginal perspectives into their delivery of the Alberta Biology curriculum. The aim is to discover how teachers currently integrate Aboriginal perspectives, the value teachers see in integrating Aboriginal perspectives, to identify the types of support currently provided to teachers and those supports teachers wish were available. This will involve one or two 30 minute to 1 hour in person, semi-structured interviews with Tracy Blood. She will contact you in late April or early May to set up a time during May or June which is most convenient for you.

The interview will be audio-recorded, and the researcher who is conducting the interview will also take notes during the interview. Upon transcription of the interview (completed by the researcher, Tracy Blood), copies will be made available to the participants to verify or expand on any information provided. Second interviews may be requested. Interviews will be conducted in locations deemed convenient to the participants.

The researcher will protect your confidentiality, and your identity will remain anonymous. The answers to the interview questions will be handled in compliance with the University of Alberta Standards for the Protection of Human Research Participants, and will be used to write a thesis, research papers and make conference presentations. Names will not be used when direct quotations are used and any identifying information (e.g. name or school) will be omitted whenever the results are made public. For further information of these standards you can see http://www.uofaweb.ualberta.ca/gfcpolicymanual/policymanualsection66.cfm.

If you participate in the study, interview answers will be stored in a safe place for a minimum of 5 years (computer data will be password protected, and printed data will be locked in a cabinet in the researcher's home).

You have the right to not participate in this study. You may withdraw at any time up to one month after the data has been collected without any reasons and without any consequences for you. Your interview answers would be deleted from the study if you do withdraw. You may choose not to answer any particular questions. Please contact Tracy Blood by email or phone to indicate you would like to withdraw.

The plan for this study has been reviewed for its adherence to ethical guidelines and approved by the Education, Extension, Augustana, Campus Saint Jean Research Ethics Board (EEASJ REB) at the University of Alberta. For questions regarding participant rights and ethical conduct of research, contact the Chair of EEASJ REB at 780-492-3751.

There are two copies of the consent form attached. One is for you to complete, signifying your consent to participate in this study. The other is for you to retain for your records. If you have any questions now or in the future, or if you would like to participate, please contact me (information below)

Sincerely,

Tracy Blood
Graduate Student
Department of Secondary Education
University of Alberta
Ph: 780-916-4484
Email: tblood@ualberta.ca

Graduate Supervisor:
Susan Barker, PhD
Professor & Associate Dean, Undergraduate Student Services
Faculty of Education
University of Alberta
1-107 Education Centre North
Edmonton, AB T6G 2G5
Ph: 780-492-4952; Fax: 780-492-7533
Email: susan.barker@ualberta.ca

Appendix B

UNIVERSITY OF ALBERTA

Consent Form for Interview Participants

I,

_____,

have read the accompanying information letter and give my informed consent to participate in the research study, **Integrating Aboriginal Perspectives: Issues and Challenges Faced by Alberta Biology Teachers**, conducted by Tracy Blood, a graduate student at the University of Alberta.

I herby agree to (*please tick each item you consent to*):

- ☐ Participating in an audio-taped interview (interview 1) with the researcher
- ☐ Reading the transcribed interview of my first interview
- ☐ Participating in a second audio-taped interview (Interview 2) with the researcher if necessary

Signing this consent form indicates that I have read the "Information Letter" and understand the purpose of the study. I have been given an opportunity to ask questions about the study, and these have been answered to my satisfaction. I understand that my participation is voluntary, and that I may withdraw from the study at any time up to one month after the data has been collected, without having to give reasons, and without penalty of any sort. I understand my identity will be kept anonymous. The published results of the study will not use my name, and no data will be attributed to me in any way that will identify me. I understand that the interview data will be maintained in a secure location for a minimum of 5 years and that the data will be held until all publication from the study is complete; then it will be destroyed. I understand that the data I provide will not be used for any other purpose than is stated in the letter.

_____

(Print Name)

_____ _____

(Signature) (Date)

This plan for study has been reviewed for its adherence to ethical guidelines and approved by the Education, Extension, Augustana, Campus Saint Jean Research Ethics Board (EEASJ REB) at the University of Alberta. For questions regarding participant rights and ethical conduct of research, contact the Chair of EEASJ REB at 780-492-3751.

Appendix C

Main Question: How do non-Aboriginal teachers of Biology, conceive of incorporating Aboriginal perspectives into their teaching of Alberta Biology classes?

Sub-Questions:

IV. How do teachers incorporate Aboriginal perspectives in their teaching?
V. What value do teachers see in incorporating Aboriginal perspectives?
VI. What supports do teachers utilize or have access to while preparing lessons which incorporate Aboriginal perspectives?

Interview Questions:

I

- What do you think the program of studies means by "Aboriginal perspective"?
    - how would you define Aboriginal perspectives?

- Do you see any differences between traditional knowledge and Aboriginal knowledge?
    - if we look at the program of study, are these differences illustrated? OR
    - How are the two types of knowledge similar?

- Have you ever integrated an Aboriginal perspective into a lesson? If so can you please describe it and your experiences associated with teaching it?

- Present scenario (for example, taxonomy) – How might you go about incorporating an Aboriginal perspective in this context?

II

- How do you feel as a non-Aboriginal teacher with regards to integrating an Aboriginal perspective into your teaching?
    - please explain
    - has something happened to make you feel this way?

- Do you see value in incorporating or infusing Aboriginal perspectives in your teaching?

    - why or why not?

III

- What sources do you refer to while planning a lesson?
    - where do you obtain your information?

- What sort of support have you received or pursued regarding incorporating Aboriginal perspectives?

    - any professional development? Material resources? Administrative support?
    - Are there any supports you think you need and wish were available?

Appendix D

Ethics Application

ID:Pro00010561

Status: Approved

1.1 Study Identification

*All questions preceded by a red asterisk * are required fields. Other fields may be required by the REB in order to evaluate your application. Please answer all presented questions that will reasonably help to describe your study or proposed research.*

1.0 *** Short Study Title** *(restricted to 250 characters)* **:**
Integrating an Aboriginal Perspective: Issues and Challenges Faced by Biology Teachers

2.0 *** Long Study Title** *(can be exactly the same as short title)***:**
Integrating an Aboriginal Perspective: Issues and Challenges Faced by Biology Teachers

3.0 *** Select the appropriate Research Ethics Board:**
EEASJ REB

4.0 *** Which office requires notification of ethics approval to release funds or finalize the study contract?** *(It is the PI's responsibility to provide ethics approval notification to any office other than the ones listed below)*
Not applicable

5.0 *** Name of Principal Investigator** *(at the University of Alberta, Covenant Health, or Alberta Health Services)***:**
Tracy Blood

6.0 **Investigator's Supervisor** *(Required for graduate students and trainees NOT applying to the Health Research Ethics Board (HREB). The HREBs do not accept graduate students or trainees as Principal Investigators in an ethics application. Please enter your supervisor as the PI and yourself as a co-investigator in your application for HREB.*

Susan Barker

7.0 *** Type of research/study:**
Graduate Student - Thesis, Dissertation, Capping Project

8.0 **Study Coordinators/Assistants** *(will have access to and can edit this application and will receive all notifications for this study*):

Name	Employer
There are no items to display	

9.0 **Co-Investigators (*Authorized List*):** The following people can act as co-authors to this application: they will have access to, and can edit, this ethics application online. Co-investigators do not receive HERO notifications about the progress of the applications unless they are added to the study email list.

Name	Employer
There are no items to display	

10.0 **Study Team** *(co-investigators, supervising team, other study team members who do not require access to this application or to receive notifications)* **:**

Last Name	First Name	Organization	Role	Phone

Email
There are no items to display

1.3 Study Funding Information

1.0 Type of Funding:
Unfunded

If OTHER, provide details:

2.0 Funding Source

2.1 Select all sources of funding from the list below:
There are no items to display

2.2 If not available in the list above, write the Sponsor/Agency name(s) in full (you may add multiple funding sources):
There are no items to display

3.0 Location of funding source *(required if study is funded)***:**
There are no items to display

4.0 RSO University- Managed Funding

4.1 If your funds are managed by the Research Service Office (RSO), select the project ID and title from the lists below to facilitate release of your study funds. *(Not available yet)*

4.2 If not available above, provide all identifying information about the study funding: Project ID Project Title Speed Code Other Information
There are no items to display

1.4 Conflict of Interest

1.0 * Are any of the investigators or their immediate family receiving any personal remuneration (including investigator payments and recruitment incentives but excluding trainee remuneration or graduate student stipends) from the funding of this study that is not accounted for in the study budget ?

○ Yes ◉ **No**

If YES, explain:

2.0 * Do any of investigators or their immediate family have any proprietary interests in the product under study or the outcome of the research including patents, trademarks, copyrights, and licensing agreements ?

○ Yes ◉ **No**

3.0 Is there any compensation for this study that is affected by the study outcome?

○ Yes ◉ **No**

4.0 Do any of the investigators or their immediate family have equity interest in the sponsoring company? (This does not include Mutual Funds)

○ Yes ◉ **No**

5.0 Do any of the investigators or their immediate family receive payments of

other sorts, from this sponsor (i.e. grants, compensation in the form of equipment or supplies, retainers for ongoing consultation and honoraria)?

○ Yes ◉ **No**

6.0 **Are any of the investigators or their immediate family, members of the sponsor's Board of Directors, Scientific Advisory Panel or comparable body?**

○ Yes ◉ **No**

7.0 **Do you have any other relationship, financial or non-financial, that, if not disclosed, could be construed as a conflict of interest?**

○ Yes ◉ **No**

If YES, explain:

Important
If you answered YES to any of the questions above, you may be contacted by the REB for more information or asked to submit a Conflict of Interest Declaration.

1.5 Study Locations and Sites

1.0 *** Specify research locations: Enter all locations where the research will be conducted under this Research Ethics Approval** *(eg. university site, hospital, community centre, school, classroom, participant's home, in the field, clinician's private office, internet website, etc. - provide details)* **:**
In the field, either in schools in the Edmonton surrounding area or convenience locations such as coffee shops and public venues as determined by the research in consultation with the participants.

2.0 *** Please check if your study will utilize or access facilities, programmes, resources, staff, students, specimens, patients or their records, at any of the sites affiliated with the following** *(select all that apply):* Not applicable

Details must be provided if Alberta Health Services and/or Covenant Health and/or Capital Care selected:

3.0 **If the study involves researchers in other institution(s), will ethics approval be sought from other institutions/organizations** *(eg. another university, Alberta Cancer Board, school district board, etc)***?** Not Applicable

If YES, provide a list:

Name
There are no items to display

2.1 Study Objectives and Design

1.0 **Proposed Start Date:**
4/19/2010

2.0 **Proposed start date for working with human participation** *(can be the same as item 1.0)* **:**
4/19/2010

3.0 **Proposed end date for working with human participation:**
12/31/2010

4.0 *** Provide an abstract or lay summary of your proposed research** *(restricted to approx. 300 words)* **:**

The new Biology 20-30 Program of Studies (2007) has mandated the implementation of Aboriginal perspectives throughout the curriculum as a way for students to develop an appreciation of the contributions Aboriginal peoples have made to science and technology. Implementation in other curricula in Alberta and curricula in other jurisdictions have yielded success, particularly with Aboriginal students, however, teachers have expressed difficulties with this implementation. The majority of the research concerning implementation of Aboriginal perspectives in the curriculum has been performed in Saskatchewan and Manitoba, primarily with elementary teachers or secondary humanities teachers and teachers with student populations high in Aboriginal students. This suggests research concerning teacher perspectives on Aboriginal implementation from Alberta, with biology teachers and those teachers of primarily non-Aboriginal students is warranted.

The conceptual framework that will be used is based on a framework developed by Rogan and Grayson (2003). In this framework, curriculum implementation revolves around three constructs: Profile of Implementation, Capacity to Support Implementation, and Support from Outside Agencies. I will be focusing on the area of Capacity to Support Implementation, which includes teacher factors. The success or failure of the incorporation of Aboriginal perspectives rests on the views that teachers hold regarding this incorporation, therefore, teachers are an instrumental factor in curriculum implementation as multiple researchers have suggested (Fishman & Krajcik, 2003; Fullan, 1993; Fullan, 2007; O'Sullivan, 2002; Pinto, 2005; Snyder, et al, 1992). I will be using qualitative methodology with case study methods to investigate the following question: How do non-Aboriginal Biology teachers conceive of incorporating Aboriginal perspectives into their delivery of the Alberta Biology curriculum? Semi-structured interviews with non-Aboriginal Biology teachers will be conducted with member checks, peer debriefing and negative cases being used to validate analysis of data.

5.0 * Provide a description of your proposed research *(study objectives, background, scope, methods, procedures, etc) (restricted to approx. 1,000 words)* **:**

Introduction

The incorporation of Aboriginal perspectives has been included in the new Alberta Biology 20-30 Program of Study (Alberta Education, 2007), as well as in all new Alberta programs of study. The rationale for implementing Aboriginal perspectives in the Alberta science curricula is "to develop, in all students, an appreciation of the cultural diversity and achievements of First Nations, Metis and Inuit (FNMI) peoples" (Alberta Education, 2007, p. 2). To do this, courses

were designed to "acknowledge the contributions of Aboriginal peoples to understandings of the natural world" (Alberta Education, 2007, p. 2), demonstrate humankind's interconnectedness to the environment, integrate learning from different scientific disciplines and to improve the success of all learners in the classroom (Alberta Education, 2007).

While investigations surrounding the incorporation of Aboriginal perspectives have been done, they often focus on the students' response to the curricular implementation (Kanu, 2005). The investigations typically profile teaching situations with large proportion of Aboriginal students often being taught by non-Aboriginal teachers (Aikenhead & Huntley, 1999; Goulet, 2001; Kanu, 2005; Taylor, 1995; Wotherspoon, 2007). Aikenhead and Huntley (1999) who encourage a curriculum which contains Aboriginal perspectives, suggest that those students who do not have cultural ties to Aboriginal culture may not see the relevance of a curriculum framed by an Aboriginal world view. If the students do not see the relevance, will the teachers? Have the teachers? There has also been a gap when related to the lack of focus on the viewpoint of science educators (Goulet, 2001; Kanu, 2005; Taylor, 1995). Goulet (2001), Kanu (2005) and Taylor (1995) each focused on elementary teachers, social studies and English language arts teachers, and curricular generalists, respectively. Although Aikenhead and Huntley (1999) discussed science teachers' perspectives, they did not identify the grade levels their teacher participants taught, nor did they identify the proportion of Aboriginal versus non-Aboriginal students in the classrooms. Finally, the primary Canadian literature addressing teacher viewpoints concerning integration of Aboriginal perspectives have come from Manitoba and Saskatchewan (Aikenhead & Huntley, 1999; Goulet, 2001; Kanu, 2005; Witt, 2006; Wotherspoon, 2007), which may not adequately represent an Alberta perspective. How science teachers are incorporating Aboriginal perspectives in the curriculum is important if one considers that a Western scientific perspective and an Aboriginal perspective are diametrically opposed. If teachers are an instrumental factor in curriculum implementation as multiple researchers have suggested (Fishman & Krajcik, 2003; Fullan, 1993; Fullan, 2007; O'Sullivan, 2002; Pinto, 2005; Snyder, et al, 1992), thenthe success or failure of the incorporation of Aboriginal perspectives rests on the views that teachers hold regarding this incorporation. As such the primary question being investigated in this study is: How do non-Aboriginal Biology teachers conceive of incorporating Aboriginal perspectives into their delivery of the Alberta Biology curriculum?

Conceptual Framework

To look at the issue of Biology teacher's perspectives on including Aboriginal perspective into the curriculum, part of a framework developed by Rogan and Grayson (2003) will be used. Rogan and Grayson hypothesized that implementation can revolve around three major constructs: Profile of Implementation, Capacity to Support Innovation and Support from outside agencies. Capacity to Support Innovation is the most important construct for this study as it is "an attempt to understand and elaborate on the school-based factors that are able to support, or hinder, the implementation of new ideas and practices" (Rogan & Grayson, 2003). Key to this is the beliefs and opinions held by teachers, which falls under teacher factors.

Core Research Questions

The main research question being investigated is: How do non- Aboriginal Biology teachers conceive of incorporating Aboriginal perspectives into their delivery of the Alberta Biology curriculum. Subsidiary questions are:

I. How do teachers incorporate Aboriginal perspectives in their teaching?

II. What value do teachers see in incorporating Aboriginal perspectives?

III. What supports do teachers utilize or have access to while preparing lessons which incorporate Aboriginal perspectives?

Significance of the Study

As suggested, teachers play a pivotal role in the implementation of any new curricular innovation. The literature clearly highlights the importance of incorporating Aboriginal perspectives into the curriculum to help Aboriginal students be more successful in school. This study is significant because the results may help to guide and develop appropriate professional development sessions and resources that may assist teachers in incorporating Aboriginal perspectives.

Methodology

This research study will use qualitative research methodology. To do this an exploratory case study will be used. Yin (2009) identifies that "case studies are the preferred method when (a) "how" or "why" questions are being posed, (b) the investigator has little control over events, and (c) the focus is on a contemporary phenomenon within a real-life context" (p. 2). The 'case' in this instance is the implementation of Aboriginal perspectives by Biology teachers. Although mixed methods research may provide a more detailed case description, due to time constraints, qualitative methods will be used as a first step in exploring this case. The participants in the

study will be non- Aboriginal Alberta Biology teachers who teach in schools with predominantly non-Aboriginal students. Participant recruitment will include asking acquaintances of the research and using an intermediary to identify further participants. The research will include performing semi-structured interviews with participants (see interview questions). Following transcription of these interviews, copies will be made available to participants to clarify or expand on any information provided. Second interviews may be requested to make clear any emerging themes. Data will be qualitatively analyzed to elucidate themes related to curriculum integration that emerge. Validity will be enhanced by trustworthiness and authenticity. Member checks, peer debriefing and testing of emerging assertions for negative cases will be done to enhance trustworthiness, while authenticity will be enhanced by seeking a range of interpretations and reporting an analysis of assertions.

6.0 Describe procedures, treatment, or activities that are above or in addition to standard practices in this study area *(eg. extra medical or health-related procedures, curriculum enhancements, extra follow-up, etc)***:** Not Applicable

7.0 If this research proposal has received independent scientific or methodological review, provide information *(eg. names of committees or individuals involved in the review, whether review is in process or completed, etc)***:**
Not Applicable

8.0 If this application is related to or builds upon a previously approved application at the University of Alberta, please provide the study title and ethics file/approval number or any other reference if available: Not Applicable

3.1 Risk Assessment

1.0 * After reviewing the Minimal Risk Criteria provided in User Help, provide your assessment of the risk classification for this study:

Minimal Risk

2.0 * In a scale of 0 to 10 where 0 = No Likelihood, 5 = Moderate Likelihood and 10 = Extreme Likelihood, put a numerical rating in response to each of the following:

Rate	Description of Potential Risks and Discomforts
1	Psychological or emotional manipulations will cause participants to feel demeaned, embarrassed, worried or upset
1	Participants will feel fatigued or stressed
2	Questions will be upsetting to the respondents
0	Participants will be harmed in any way
0	There will be cultural or social risk
0	There will be physical risk or physiological manipulations, including injury, infection, and possible intervention side-effects or complications
1	The risks will be greater than those encountered by the participants in everyday life

3.0 * Provide details of short- and long-term risks and discomforts:
Some participants might feel slightly threatened to disclose information due to discussing questions related to a government mandated curricular implementation that they may or may not be following.

4.0 *** Describe how you will manage and minimize risks and discomforts, as well as mitigate harm:** Participants will be assured before, during and after the data collection that their anonymity will be maintained and that they will have the option to member check the interview transcripts and add and subtract as they think appropriate. Participants will not be required to respond to questions they do not wish to address, nor will they be coerced into participation.

5.0 *** If your study has the potential to identify individuals that are upset, distressed, or disturbed, or individuals warranting medical attention, describe the arrangements made to try to assist these individuals. Explain if no arrangements have been made:**
It is not anticipated that the participants in this study will be upset, distressed, or disturbed however, just in case, I will add in the consent letter that should anything be brought to the attention of the researcher which is against the professional code of conduct I would be bound to follow the relevant code of conduct.

3.2 Benefits Analysis

1.0 **Describe any benefits of the proposed research to the participants:**
The discussion format of the interviews will allow participants to gain clarity into their opinion and reflect upon their own teaching practices. Through this process participants will be stimulated to consider Aboriginal perspectives. The participants will develop an enhanced awareness of the process of research inquiry.

2.0 *** Describe the scientific and/or scholarly benefits of the proposed research:**
At present there are no known studies to the researcher that discuss Biology teachers' views on incorporating Aboriginal perspectives in the Alberta Biology curriculum. While much research has been done in Manitoba and Saskatchewan, with a high Aboriginal student population, looking at English Language Arts, Social Studies and general Science teachers, this study aims to fill the gap concerning Alberta teachers in a specific subject with lower Aboriginal student populations.

3.0 **Describe any benefits of the proposed research to society:**
Aboriginal perspectives have been mandated across all new curricula in Alberta. This study will attempt to inform policy makers how teachers view Aboriginal perspectives and possibly help with professional development with the goal of helping all students be successful in science.

4.0 **Benefits/Risks Analysis - describe the relationship of benefits to risk of participation in the research:**
The benefits of this study far outweigh any possible risks.

4.1 Participant Information

1.0 **Describe and justify the inclusion criteria for participants (eg. age range, health status, gender, etc):** Non-Aboriginal Alberta Biology teachers who teach Biology in schools with predominantly non-Aboriginal students.

2.0 **Describe and justify the exclusion criteria for participants:**
Not applicable

3.0 **Are there any direct recruitment activities for this study?**
◉ **Yes** ○ No

4.0 **Participants**

Total number of participants you expect to enroll *(including controls, if applicable)***:**

12
Of these how many are controls, if applicable *(Possible answer: Half, Random, Unknown, or an estimate in numbers, etc).*
Nil
If this is a multi-site study, how many participants *(including controls, if applicable)* **do you anticipate will be enrolled in the entire study?**

5.0 Justification for sample size:
This study employs an exploratory case study which requires in-depth discussions with similar participants to gauge any possible differing perspectives. This is a Master's thesis and as such I have limited time to complete the study.

6.0 If possible, provide expected start and end date of the recruitment/enrollment period: Expected Start Date: 4/19/2010 Expected End Date: 9/30/2010

4.2 Recruit Potential Participants

1.0 Recruitment

1.1 Will potential participants be recruited through pre-existing relationships with researchers *(eg. employees, students, or patients of research team, acquaintances, own children or family members, etc)***?** ◉ **Yes** ○ No

1.2 If YES, identify the relationship between the researchers and participants that could compromise the freedom to decline (eg. professor - student). How will you ensure that there is no undue pressure on the potential participants to agree to the study?
Participants will be known to the researcher as colleagues or colleagues of other participants. No power relationship exists between the researcher and any of the participants.

2.0 Outline any other means by which participants could be identified *(eg. response to advertising such as flyers, posters, ads in newspapers, websites, email, listservs; pre-existing records or existing registries; physician or community organization referrals; longitudinal study, etc)***:**
Not applicable

4.3 Recruitment Contact Methods

1.0 How will initial contact be made? Select all that apply:

Researchers will contact potential participants

Contact will be made through an intermediary

2.0 If contact will be made through an intermediary *(including snowball sampling)***, select one of the following:**
Intermediary provides information to potential participants who then contact the researchers

3.0 If contact will be made through an intermediary, explain why the intermediary is appropriate and describe what steps will be taken to ensure participation is voluntary:
The intermediary is appropriate for identifying a participant pool outside of those teachers known to the researcher. Potential participants will contact the researcher voluntarily.

4.0 Provide the locations where participants will be recruited, *(i.e. educational institutions, facilities in Alberta Health Services or Covenant Health, etc)***:**
Within schools in Edmonton surrounding area.

4.4 Informed Consent Determination

1.0 * Describe who will provide informed consent for this study:
All participants will be competent to give informed consent

2.0 How is consent to be indicated and documented?
Signed consent form

3.0 What assistance will be provided to participants, or those consenting on their behalf, who have special needs *(eg non-English speakers, visually impaired, etc)***:**
Not applicable

4.0 If at any time a participant wishes to withdraw or not participate in certain aspects of the research, describe the procedures and the last point at which it can be done:
The participant can withdraw their consent to be involved in the data collection at any time by advising the researcher verbally or by email.

5.0 Describe the circumstances and limitations of data withdrawal from the study, including the last point at which it can be done:
Participants may withdraw their consent for the use of their data up to one month after the data was collected.

6.0 Will this study involve an entire group where non-participants are present ?

○ Yes ◉ **No**

7.0 Describe the incentives and/or reimbursements, if any, to participants and provide justification:
Nil.

4.8 Study Population Categories

1.0 * This study is designed to TARGET or specifically include the following *(does not apply to co-incidental or random inclusion)* **. Select all that apply:**
Not applicable

5.1 Research Methods and Procedures

1.0 * This study will involve the following *(select all that apply)*
The list only includes categories that trigger additional page(s) for an online application. For any other methods or procedures, please indicate and describe in your research proposal in the Study Summary, or provide in an attachment:
Interviews (eg. in-person, telephone, email, chat rooms, etc)

2.0 Does this study involve a Clinical trial *(includes any research study that prospectively assigns human participants or groups of humans to one or more health-related intervention(s) to evaluate the effects on healthoutcomes; does not include randomized controlled trials – RCT – outside of clinical settings)?*
○ Yes ◉ **No**

3.0 For registered clinical trial(s), provide registry and registration number, if available:

4.0 Internet-based research
4.1 Will you be doing any internet-based research that involves interaction

with participants?

○ Yes ◉ **No**

4.2 If YES, will these interactions occur in private spaces (eg. members only chat rooms, social networking sites, email discussions, etc)?

○ Yes ◉ **No**

4.3 Will these interactions occur in public space(s) where you will post questions initiating and/or maintaining interaction with participants?

○ Yes ◉ **No**

5.0 If you are using any tests in this study diagnostically, indicate the member(s) of the study team who will administer the measures/instruments:

Test Name | Test Administrator | Organization | Administrator's Qualification

There are no items to display

6.0 If any test results could be interpreted diagnostically, how will these be reported back to the participants?

Not applicable

5.7 Interviews, Focus Groups, Surveys and Questionnaires

1.0 Are any of the questions potentially of a sensitive nature?

◉ **Yes** ○ No

If YES, provide details:

Some participants may feel that some questions pertaining to Aboriginal education are sensitive in nature.

2.0 If any data were released, could it reasonably place participants at risk of criminal or civil law suits?

○ Yes ◉ **No**

If YES, provide the justification for including such information in the study:

3.0 Will you be using audio/video recording equipment and/or other capture of sound or images for the study?

◉ **Yes** ○ No

If YES, provide details:

Interviews will be audio-recorded.

6.1 Data Collection

1.0 * Will the study team know the participants' identity at any stage of the study?

Yes No

2.0 Primary/raw data collected will be *(check all that apply)* **:**

Anonymous
Confidential
Coded
All personal identifying information removed

3.0 If identifying information will be removed at some point, when and how will this be done?
All identifying information will be replaced with codes during the transcription of the raw interview data.

4.0 If this study involves secondary use of data, list all sources:
Not Applicable

5.0 In research where total anonymity and confidentiality is sought but cannot be guaranteed *(eg. where participants talk in a group)* **how will confidentiality be achieved?**
Not applicable

6.2 Data Identifiers

1.0 * Personal Identifiers: will you be collecting any of the following *(check all that apply)* **:**
Full Name

If OTHER, please describe:
Gender, subject's taught as a teacher, years of teaching experience, race.

2.0 Will you be collecting any of the following *(check all that apply)* **:**
There are no items to display

If OTHER, please describe:
Not applicable

3.0 If you are collecting any of the above, provide a comprehensive rationale to explain why it is necessary to collect this information:
Not applicable

4.0 Specify information that will be RETAINED once data collection is complete, and explain why retention is necessary. Include the retention of master lists that link participant identifiers with de-identified data: Name, gender, subject's taught as a teacher, years of teaching experience, race.

5.0 If applicable, describe your plans to link the data in this study with data belonging to another organization:
Not applicable

6.3 Data Confidentiality and Privacy

1.0 * How will confidentiality of the data be maintained? Explain the steps you propose to maintain data confidentiality and privacy. *(For example, study documents must be kept in a locked filing cabinet and computer files encrypted, etc.)*
Raw data will be stored in a locked filing cabinet at the house of the researcher. Coded and transcribed data will be stored on a password protected personal computer owned by the researcher.

2.0 What privacy education/training do members of the team have prior to their access to data?
The researcher has completed the mandatory ethics training components of EDSE 510 and EDSE 511 as per the graduation requirements through the Department of Secondary Education.

3.0 If you involve colleagues, assistants, transcribers, interpreters and/or other personnel to carryout specific research tasks in your study, how will you ensure that they properly understand and adhere to the University of

Alberta standards of data privacy and confidentiality?
Not applicable.

4.0 Data Access

*** 4.1 Will the researcher make raw data that identify individuals available to persons or agencies outside of the research team?**

○ Yes ◉ **No**

4.2 If YES, describe in detail what identifiable information will be released, to whom, why they need access, and what safeguards will be used to protect the identity of subjects and the privacy of their data.

4.3 Provide details if identifiable data will be leaving the institution, province, or country *(eg. member of research team is located in another institution or country, etc.)*
Not applicable.

6.4 Data Storage, Retention, and Disposal

1.0 Where will the research data be stored? Specify the physical location and how it will be secured to protect confidentiality.
Raw data will be stored in a locked filing cabinet at the house of the researcher. Coded and transcribed data will be stored on a password protected personal computer owned by the researcher.

2.0 Describe what will happen to the data once the study is completed. Indicate your plans for the destruction of the identifiers at the earliest opportunity consistent with the conduct of the research and/or clinical needs:
Raw data will be stored in a locked filing cabinet at the house of the researcher. Coded and transcribed data will be stored on a password protected personal computer owned by the researcher. The data will be stored for a period of five years after which it will be destroyed.

3.0 You must keep your data for a minimum of 5 years according to GFC Policy 96.2. How will you provide for data security during this time?
Raw data will be stored in a locked filing cabinet at the house of the researcher. Coded and transcribed data will be stored on a password protected personal computer owned by the researcher.

7.1 Documentation

Add documents in this section according to the headers. Use Item 12.0 "Other Documents" for any material not specifically mentioned below. Sample templates are available in the HERO Home Page in the **Forms and Templates**, or by clicking HERE.

Important: Please do not use .docx files as attachments. It is recommended you convert these files first to .doc (standard Word document files) before attachi

1.0 Recruitment Materials:

Document Name	Version	Date	Description
There are no items to display			

2.0 Letter of Initial Contact:

Document Name	Version	Date	Description

Invitation Letter	0.02	4/5/2010 2:56 PM

3.0 Informed Consent / Information Document(s) :

3.1 What is the reading level of the Informed Consent Form(s):

18 year and older

3.2 Informed Consent Form(s)/Information Document(s):

Document Name	Version	Date	Description
Consent Form	0.02	4/5/2010 2:57 PM	

4.0 Assent Forms:

Document Name	Version	Date	Description
There are no items to display			

5.0 Questionnaires, Cover Letters, Surveys, Tests, Interview Scripts, etc.:

Document Name	Version	Date	Description
Interview Questions	0.01	3/18/2010 8:41 PM	

6.0 Protocol:

Document Name	Version	Date	Description
There are no items to display			

7.0 Investigator Brochures/Product Monographs *(Clinical Applications only)***:**

Document Name	Version	Date	Description
There are no items to display			

8.0 Health Canada No Objection Letter *(NOL)* **:**

Document Name	Version	Date	Description
There are no items to display			

9.0 Confidentiality Agreement:

Document Name	Version	Date	Description
There are no items to display			

10.0 Conflict of Interest:

Document Name	Version	Date	Description
There are no items to display			

11.0 Other Documents:

For example, Study Budget, Course Outline, or other documents not mentioned above

Document Name	Version	Date	Description
There are no items to display			

Final Page

You have completed your ethics application! Please select "Exit" to go to your study workspace.