Abstract

Curriculum integration, while a commonly used educational term, remains a challenging concept to define and examine both in research and in classroom practice. Numerous types and definitions of curriculum integration exist in educational research, while, in comparison, teachers tend to focus on curriculum integration simply as a mixing of subject areas. To better understand curriculum integration in practice, this thesis details a case study that examines both teacher and student perspectives regarding a grade nine integrated unit on energy. Set in a public secondary school in Ontario, Canada, I comprehensively describe and analyze teacher understandings of, and challenges with, the implementation of an integrated unit, while also examining student perspectives and academic learning. My participants consisted of two high school teachers, a geography teacher and a science teacher, and their twenty-three students. Using data gathered from interviews before, during, and after the implementation of a 16-lesson unit, as well as observations throughout, I completed a case description and thematic analysis. My results illustrate the importance of examining why teachers choose to implement an integrated unit and the planning and scheduling challenges that exist. In addition, while the students in this study were academically successful, clarification is needed regarding whether student success can be linked to the integration of these two subjects or the types of activities these two teachers utilized.
Table of Contents

Chapter One: Introduction ................................................................. 1
  An Introduction to Curriculum Integration ................................... 3
  A Case Study of Curriculum Integration: An Overview .............. 8
    My research questions ......................................................... 9
  Structure of my Dissertation .................................................... 11

Chapter Two: Literature Review ..................................................... 13
  Identifying Relevant Literature on Curriculum Integration ......... 13
  What is Curriculum Integration? ............................................... 15
    Curriculum integration as an end result ............................... 15
    Curriculum integration as an approach to instruction ............ 17
  Classifying curriculum integration for this study .................... 19
    Multidisciplinary or correlated. ........................................... 19
    Interdisciplinary or shared. ............................................... 20
    Transdisciplinary or reconstructed. ..................................... 20
  Research Regarding Curriculum Integration ............................... 22
    Teacher perspectives ......................................................... 22
    Implementation of curriculum integration ............................ 25
    Student learning ............................................................... 27
  Examining Policy References to Curriculum Integration ............. 32
    Western Canada and the North .............................................. 33
      BC and the Yukon .............................................................. 33
      Alberta and Nunavut ....................................................... 34
      Saskatchewan ................................................................. 35
      Manitoba ....................................................................... 36
      Northwest Territories ...................................................... 37
    Ontario ........................................................................... 38
    The Atlantic provinces ....................................................... 41
    A Canadian summary .......................................................... 42
  Chapter Conclusion ................................................................. 43

Chapter Three: Research Design ..................................................... 46
  Research Methodology...Why a Case Study? ............................... 46
    Intrinsic or instrumental case study? .................................... 47
    Recognizing researcher biases ............................................. 48
  Setting and Participants .......................................................... 50
  Data Sources ....................................................................... 53
    Pre-unit data collection ...................................................... 54
    During-unit data collection ............................................... 55
    Post-unit data collection ..................................................... 56
  Data Analyses ....................................................................... 58
    Description of the case ....................................................... 58
    Thematic analysis ............................................................... 60
Chapter One: Introduction

Throughout my teaching career, I have been a strong supporter of curriculum integration—even if I had been unable to give it that name. To me, it just made sense. Rather than always thinking in terms of separate subject areas (e.g., math, social studies, reading, etc.), I thought in terms of projects and themes. I organized my classroom so it looked like the 1400’s and took my students through lesson plans that covered major events leading up to present day. I had my class build scale models of how the local community changed (social studies), design tools (technology), calculate farming areas (math), and write perspective pieces from different centuries (language arts), all part of a history unit designed to familiarize students with their community. My students were excited to come to class. It was fun, motivating, and covered a large number of curricular outcomes. That was how the world made sense to me and that was how I shared it with my students. However, there were challenges.

I spent most of my teaching career in elementary classrooms in British Columbia (BC) and, while my students enjoyed my integrated units, I had concerns regarding their discipline-specific learning. To illustrate I will use an example from my grade 2/3 class. In BC elementary schools, the curriculum was (and still is) organized by disciplines or subject areas (e.g., mathematics, social studies, science, physical education, etc.) with prescribed learning outcomes (PLOs) for each subject area. I designed an integrated unit around Canadian government. We had a parent dress up as the Queen of England, visit our classroom, and appoint a Governor-General. We had an election for Prime Minister, who then selected his or her Cabinet. We had additional elections for the House of Commons. We wrote laws, enacted consequences, and held a mock trial. A number of
parents heard about our activities and asked to be part of the audience for our mock trial. One of my parents explained how her daughter was coming home each day, excitedly retelling the different events that were happening in our classroom. However, when my student was asked what it was all about, she replied: “I don’t know, but it’s really exciting.”

My students seemed motivated and actively participated in class. They appeared to understand some of the key outcomes (e.g., getting frustrated with the selection versus election process…recognized that it was really important who they elected as Prime Minister); however, they were obviously missing key ideas as well. As a result, assessment was a challenge—high participation did not necessarily mean high discipline-specific learning. In addition, this integrated unit took a great deal of time. I wondered whether I covered the PLOs effectively and whether high student motivation was enough to warrant the time invested.

However, it was not until I re-entered university for my graduate studies that I began to look more closely at the concept of curriculum integration. My experiences in BC had always related integration to working with students with special needs. The BC Ministry of Education has numerous documents using the term *integration* to refer to the inclusion of students with special needs in the mainstream classroom (e.g., BC Ministry of Education, 2006, p. v). Not until working on my master’s degree was I introduced to the idea of curriculum integration as the mixing of subject areas (Adler & Flihan, 1997). I felt a strong affinity for it, suddenly having a name or label to attach to my teaching practices. That opportunity to name my practices was empowering and I began researching the integration of curricula in elementary and secondary classrooms.
Unfortunately, I quickly became dissatisfied with the research I found on curriculum integration. Studies appeared to either focus on classifying different types of integration or seemed to narrowly focus on teacher perceptions, student motivation, or activity sequences; rarely did I find these aspects of curriculum integration discussed in relation to each other. I found it difficult to find research that started at the beginning with teacher planning and perceptions, provided a detailed discussion of the implementation, and finished with a thorough examination of teacher and student learning. This whole picture view of curriculum integration seemed absent in the dissection of all the parts. Consequently, for my doctoral dissertation, I aimed to comprehensively describe teacher and student perceptions, experiences, and learning, throughout an integrated unit.

An Introduction to Curriculum Integration

Throughout my investigation into curriculum integration, three things became clear. First, I found that there was not one type of curriculum integration being discussed (Ross & Hogaboam-Gray, 1998). I discovered a large spectrum of classroom activities labelled curriculum integration (Relan & Kimpston, 1993). On one end of the spectrum, parallel (Drake, 1998) or multidisciplinary units kept the subjects or disciplines separate and distinct. Disciplines were considered natural entities that involved different types of knowledge, thereby making it important to keep the lines between subject areas visible (e.g., teacher clarifying for students when they are working on science versus language arts). In contrast, at the other end of the spectrum were restructured units (Applebee, Adler, & Flihan, 2007) with no distinctions between disciplines. Here, teachers seemed to disregard subject areas and PLOs and design units around key problems or questions.
(e.g., how best to preserve the local wetlands). In these units, curriculum outcomes were not used to determine the content of the unit; the question or problem determined the knowledge and skills to be learned.

Given this range of curriculum integration, teachers appeared to experience different challenges when planning and teaching their units (Wineburg & Grossman, 2000). For example, teachers implementing a restructured unit were challenged when trying to evaluate students using subject driven curriculum outcomes. Teachers were required to report grades relevant to subject areas instead of the question or concern under investigation (Meier, Cobbs, & Nicol, 1998). In contrast, teachers who utilized a parallel unit were often challenged when planning their units as they worked around a timetable organized by subject areas (Wallace, Sheffield, Rennie, & Venville, 2007). Given these differences, it was likely that students also experienced variations in their learning. Consequently, I feel it is important when examining research regarding curriculum integration that the types of activities involved in the unit are made explicit, with student learning included.

Second, research on the value of curriculum integration seemed mixed. While I found articles that repeatedly espoused the benefits of curriculum integration with respect to student motivation, I found few empirical studies that reported on its academic value (as noted by Adler & Flihan, 1997; Berlin & Hillen, 1994; Berlin & Lee, 2005; Czerniak, Weber, Sandmann, & Ahern, 1999; Lederman & Niess, 1997; Meier et al., 1998; Venville, Rennie, & Wallace, 2003). For example, Venville et al. (2003) provide a detailed account of student learning in an integrated unit. The study describes a science, mathematics, and technology unit that used integration to enable students to “design and
produce a solar powered vessel that [would] outperform anyone else’s vessel” (p. 457).

An overview of the unit, detailed descriptions of a few specific lessons, and descriptions of the knowledge and skills acquired by specific pairs of students were discussed. The study revealed that “some formal science concepts—such as the idea of a closed circuit—were transferred directly by the students…[However,] the formal science knowledge seemed to comprise only a limited component of their sources of knowledge” (p. 471).

Venville et al. highlight the challenge of balancing “meaningful, applied learning situations in integrated contexts…[and the] focus on traditional, conceptual learning of subject-based knowledge” (p. 472). The detail provided by Venville et al. was unusual in that these authors described both the content of the unit and students’ learning outcomes. I later argue that a detailed and comprehensive examination of both aspects is necessary in order to determine the academic value of integrated curricula. This observation led to my third realization regarding research into curriculum integration: literature appears to provide an incomplete picture of integration in practice.

Most articles on curriculum integration appear to either describe the unit a teacher (or group of teachers) has planned and/or implemented (e.g., Bintz, Moore, Hayhurst, Jones, & Tuttle, 2006; Diem, 1996) or report on students’ success without describing the integrated unit, how it was planned, or how it was implemented (e.g., Nuthall, 1999). To illustrate the difference between these types of studies, I contrast two studies: Nuthall (1999) and Diem (1996). Below, I describe these studies while I expand on these differences in chapter two.

After tracking student concept attainment during an integrated science and social studies unit, including post tests up to 12 months after the unit, Nuthall (1999) reports
that “learning occurs when students experience a sequence of relevant information with no more than 2 days between each experience. Something occurs in working memory during that sequence that results in a specific knowledge construct being created and stored in long-term memory” (p. 310). The study provides detailed information about student learning, including transcripts of student answers illustrating how students’ understanding of specific content (i.e., knowledge of Antarctica) changed over time. However, the report provides little information regarding how the unit (science and social studies) was integrated and minimal details on the types of activities and how they related to the unit objectives. For example, the author referred to class discussion, debriefs, and essay writing, but did not explain how these activities related to the content. Neither was there information about how the teacher planned and developed the unit.

In contrast, Diem (1996) provides much detail regarding how teachers planned an integrated unit encompassing English, social studies, and mathematics. Diem reports that teachers participated in a “two-week long integrated curriculum training session prior to the start of the school year” (p. 96) and were provided with “parallel schedules, including conference periods, a team leader responsible for administrative duties, and a budget for various activities” (p. 96). However, my reading revealed very little information about how the unit was implemented. The author notes that the unit focused on the “Civil war, the industrial revolution, immigration and the great depression, the Holocaust, and the Vietnam War…[it] emphasized the understanding and solving of problems” (p. 96). However, the article did not describe the activities that were used, how the other subjects integrated with this social studies focus, or how students interacted throughout this unit. After the unit concluded, teachers reported that “students seemed to respond better to the
consistent and recurring structure of this approach than to the variety of different approaches practiced in most secondary schools” (p. 97). In addition, Diem reports increased parental involvement, “a move from teacher-centered to student centered” teaching (p. 97), and fewer behaviour problems in the classroom. However, I was unable to find specific information related to students’ learning of the unit objectives.

Nuthall (1999) provides information on student learning, but little information on the unit implementation or planning process. In contrast, Diem (1996) provides details on planning, but did not discuss unit implementation or student learning. While Venville et al. (2003) provides information related to the unit’s implementation and student learning, they did not describe the planning process of the teachers involved, nor the teachers’ perceptions of integration. As previously noted by Meier et al. (1998) and Wallace et al. (2007), planning and teacher perceptions of curriculum integration are important aspects that need to be addressed.

Wallace, Rennie, Malone, and Venville (2001) report concerns regarding a lack of resources for planning integrated units. Bintz et al. (2006) reveal scheduling as the biggest planning problem in middle school classrooms. As one of the teachers involved in the Bintz et al. study shared, “our schedule reflects a discipline rather than an interdisciplinary model of scheduling and that hinders the ability of teachers involved in [integrated] projects like this from having the same students” (p. 37). In addition to scheduling conflicts for middle school teachers trying to implement integrated units, Flowers, Mertens, and Mulhall (2003) reveal “that teachers need to meet for common team planning time at least four times each week for 30 minutes or more per meeting to achieve consistent positive outcomes” (p. 55). Meier et al. (1998) identify that this need
for common planning time is especially important at the secondary level as “preservice secondary teachers have limited in-depth knowledge of other subject areas” (p. 440). According to these authors, common planning time would enable secondary school teachers to share the subject-specific knowledge needed to maximize integration in each classroom. Each of these issues represent important areas of discussion for future investigations into curriculum integration.

In summary, I believe the education research community would benefit from studies detailing teacher planning, unit implementation, and student learning to facilitate a comprehensive discussion regarding curriculum integration. Accordingly, my dissertation details a study of two grade 9 teachers, one teaching science and the other teaching geography, and their twenty-three students as they completed an integrated unit on energy in a secondary school in Ontario.

A Case Study of Curriculum Integration: An Overview

This unit focused on electricity and energy use and was implemented in April and May of 2008. It involved 16 lessons (4 geography, 12 science) and twenty-three grade 9 students at Beachville1, a public secondary school in one of Canada’s largest school districts. The unit dealt with different energy sources (alternative and traditional), where those sources were located in Canada, how that energy got to Canadian homes and was used as electricity, and how Canadians could conserve electricity at home. The specific unit activities included whole class discussion, lecture, independent work, paired and small group work, and project based learning.

This group of grade 9 students enrolled in both an Applied geography and Applied science class taught by Mr. Norris and Ms. Wade, respectively. The unit was

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1 All names used in this dissertation are pseudonyms.
organized in a parallel fashion, with the science and geography classes being taught separately. In this school district, Applied courses “focus on the essential concepts of the discipline, but develop students’ knowledge and skills by emphasizing practical, concrete applications of these concepts and incorporating theoretical applications as appropriate” (Ministry of Ontario, 1999, p.14). In contrast to Academic courses designed to prepare students for university entrance, Applied courses prepare students for colleges, trade schools, or workplace preparation courses. More detail regarding this case study is provided in chapter four.

*My research questions*

For this study, I address my overall aim of contributing to our theoretical and practical understanding of curriculum integration by comprehensively describing student and teacher perspectives and learning throughout an integrated unit. For my study, I specifically asked the following research questions:

1. What are these two teachers’ perspectives and understandings regarding curriculum integration?
2. What are the issues and challenges faced by these two teachers as they implemented an integrated unit together?
3. What are the students’ perspectives on learning in this integrated setting?
4. How do students perform academically in this integrated setting and what are the issues related to this performance?

As noted by Stake (2000), case studies provide the opportunity to not only “invite attention to ordinary experience but also to the language and understanding of the common disciplines of knowledge” (p. 440). My research study was driven by a need for
comprehensive descriptions from the perspectives of teachers and students for an extended period of time. I chose case study as the “analysis consists of making a detailed description of the case and its setting” (Creswell, 1998, p. 153). This comprehensive description enabled me to relate what was learned from ordinary experience to the implementation of curriculum integration. However, while case study may enable a comprehensive gathering of data from a variety of sources and perspectives, there were limitations.

While the case study approach utilizes a variety of methods and a descriptive focus, it also presents challenges regarding data management and analysis. Given the large quantity of data associated with case studies (Creswell, 1998), it was important that data sources were bound by the case under investigation. In addition, while the analyses aimed to condense the data, they needed to remain transparent and descriptive to ensure that findings were legitimate, demonstrating clear links back to the data. Finally, while it was possible to provide a comprehensive description of this single case, the resulting findings could not be generalized beyond the case itself.

For my case study I utilized teacher and student interviews, classroom observations, and transcripts of student group work. While the observations and transcripts occurred during the unit, my interviews occurred before, during, and after the unit. My first two questions focused on the perspectives of both teachers. I utilized interviews before, during, and after the unit to track their perspectives and understandings regarding integration over a period of time (first question) while also gathering information on the challenges they experienced (second question). My third and fourth questions focused on the students—either student perspectives on integration (third
question) or evaluations of student academic learning (fourth question). Consequently, data from interviews, observations, and transcripts were used for both questions. To address concerns regarding a manageable data load, I focused my observations and interviews on seven pre-selected students (selected by the two teachers based on the following criteria: consistent attendance, range of academic achievement levels, and representation from both genders).

After data gathering, I completed a series of analyses. As per Creswell’s (1998) recommendation, the analysis includes a “description of the case, a detailed view of aspects about the case—the facts” (p. 154). Following this detailed description, I review data in relation to each of my four questions using a series of thematic analyses. I expand further on the specific details of my data analyses in chapter three. Below, I provide a detailed description of the forthcoming chapters to effectively prepare my readers.

Structure of my Dissertation

Having introduced my dissertation, chapter two provides a review of literature regarding curriculum integration. In this chapter I review the various definitions of curriculum integration and research related directly to my four questions: teacher perspectives and understandings and student perspectives and academic performance. Given the relevance of current policies regarding curriculum integration to the assessment of student learning, I also include an overview of policies specific to the Canadian education context. I conclude chapter two by expanding on some of the key gaps in the curriculum integration literature and making links between these gaps and my study.
Chapter three, research design, details my research study elaborating on why case study was the most appropriate research methodology for my study. I provide details about my participants, data sources, and analyses. I conclude chapter three by addressing validity issues in relation to legitimation, praxis, and representation and discussing the limitations of my study.

Chapter four provides a comprehensive description of the context, the teachers, the students, and a chronological detailing of the energy unit. Chapter four prepares readers for the findings detailed in chapters five and six.

Chapter five analyzes data in relation to my first two questions regarding teacher perspectives and understandings of curriculum integration throughout this energy unit. Chapter six continues with analyzes of data in relation to my last two questions examining student learning (from the point of view of students as well as evaluations of academic performance). For both chapters I detail each theme by including direct references to my data. I also provide links to existent research in relation to my identified themes.

Chapter seven concludes this study by discussing how the results relate to the overarching goal of this study: to comprehensively describe teacher perceptions, unit implementation, student academic performance and the issues that arise when utilizing an integrated unit. I then use this description and discussion of persistent issues to provide suggestions for future researchers and teachers implementing curriculum integration. I finish with a brief nod to study limitations.
Chapter Two: Literature Review

Chapter two aims to expand on the literature touched on in the introductory chapter. The purpose of this chapter is to inform readers about curriculum integration: what is curriculum integration and what have we as a community of researchers and practitioners already learned about curriculum integration? It is my aim to review the research, the concerns that have been identified, and any gaps in the research literature. To accomplish this, I begin by examining the theoretical understandings of curriculum integration including definitions of curriculum integration. I then examine the practical applications in relation to teacher and student perspectives and academic performance. Finally, I focus on policies related to curriculum integration in the Canadian context as this relates to challenges teachers may have when evaluating students’ academic performance.

Identifying Relevant Literature on Curriculum Integration

Prior to this expansion, I provide a brief overview of how I identified and selected the literature I discuss below. As a starting point, my doctoral supervisor, John Wallace, provided me with several articles that he co-authored with his Australian colleagues, Grady Venville and Leonnie Rennie. I then added to this initial contribution by using the University of Toronto’s Library Scholars Portal Search. I started with a title search for peer-reviewed, English language journals containing the title: curriculum integration. I then narrowed this search by identifying those studies that addressed elementary, middle, and secondary schools. No restrictions were placed (other than language) on country or focus. Consequently, I marked a number of records from North America, Asia, Australia, and Europe. These articles discuss research related to the description and implementation
of curriculum integration (empirical studies), review literature related to curriculum integration, and initiate theoretical discussions regarding the purpose and value of curriculum integration.

Using these marked records, I reviewed the references listed for each article to identify the most commonly referenced works on curriculum integration. This then added a number of educational texts providing instructions for practitioners regarding the implementation of curriculum integration in the classroom. After reading through these texts and articles, I returned to Scholars Portal and expanded my search to examine English written articles on elementary, middle, and secondary school uses of the following: multidisciplinary, interdisciplinary, or transdisciplinary integration.

Based on my reading of these texts and articles, it became clear that policy decisions regarding curriculum integration were important; if Ministries of Education encourage or discourage teachers to implement curriculum integration, the level of implementation within that Ministry’s area may be affected. In addition, regardless of whether a Ministry supports the implementation of curriculum integration or not, if the learning outcomes (or objectives) to be assessed remain organized by subject areas rather than integrated learning, this may pose an additional obstacle for teachers. Given this realization, I then researched policy recommendations regarding curriculum integration internationally and then, specifically, across the provinces and territories of Canada. After gathering these policy (also referred to as curriculum) documents, I completed my literature search. The analyzed results of my search begin below.
**What is Curriculum Integration?**

While curriculum integration is a commonly used term, there is a great deal of ambiguity regarding how the concept is used both by researchers and classroom teachers. In trying to understand how curriculum integration is referenced in research, I came to realize what I believe is an important a priori distinction: is curriculum integration discussed as an end result in and of itself or is it discussed as an approach to instruction? I will examine each of these in turn.

*Curriculum integration as an end result*

Many researchers discuss the value of integrated ways of knowing or thinking about the world; for these researchers, integration is examined as an end result. Relan and Kimpston (1993) discuss curriculum integration in terms of *integrated knowledge*, referring to the knowledge and higher-order thinking skills needed by citizens to “understand a complex, interrelated world” (p. 33). Recognizing rapid changes in the amount of knowledge that can be learned, the need for students to understand both global and local concerns, and the importance of ensuring that students are able to apply knowledge learned in the classroom to the “realities of life” (p. 32), Relan and Kimpston describe curriculum integration as its own way of knowing and understanding the world that moves beyond traditional, discipline-specific knowledge and skills. Viewing integrated knowledge as the concepts and thinking processes needed by students to examine complex issues—issues that connect classroom work to the lives of students, Hargreaves, Earl, Moore, and Manning (2001) argue that the traditional framework of knowledge, organized around disciplines, needs to be rethought. They ask the question, *what counts as knowledge?* This is a truly important question, but not a new one.
Based on his work as part of the Eight Year Study and the laboratory schools of the late 1930s, Harold Alberty problematized curriculum integration, viewing it as much more than just the organization of content, but as actual content itself (Alberty & Alberty, 1962). As elaborated by Bullough (1999), curriculum integration “has to do with what counts as content (e.g., problems, issues, topics, needs) and who determines what counts” (p. 163). If, as educators, we focus on teaching the full scope of subject-specific content, I would argue that we would be extremely challenged to also teach students how to connect knowledge from different subject areas. We would rarely have time to teach integrated ways of thinking about and solving problems. If we do choose to spend time on the connections and integrated ways of problem solving, some other more traditional subject-specific curriculum would likely be missed. “Alberty recognized that the most difficult of curricular questions is not what to include in the curriculum, but what to exclude from it” (Bullough, 1999, p. 164).

Other researchers, while still viewing curriculum integration as an end result, focus less on curriculum integration as a form of knowledge and more on curriculum integration as a specific type of thinking skill. Drake (2000) focuses on the importance of developing *interdisciplinary thinking skills* as an end in and of itself. She stresses that students need to learn the skill of *connecting*—making connections between subject areas so that they can solve real life problems (e.g., grocery shopping, voting in elections, investment banking, etc.). Bintz et al. (2006) also use the term *integrated thinking*. Venville, Wallace, Rennie, and Malone (2000), use the term *bridging* (instead of connecting); they discuss curriculum integration as the learning of bridges between the different discipline areas so that students are better able to apply their knowledge in
different situations. In addition, Johnson (2002) supports the value of teaching integrated thinking skills by arguing that numerous, traditionally identified skills (e.g., graphing, critical thinking, problem solving) are actually integrated skills meant to be used across different subject areas.

Curriculum integration as an approach to instruction

In contrast to discussing curriculum integration as an end result, numerous researchers instead consider curriculum integration an approach—a way to teach already existing curriculum outcomes. For example, Czerniak (2004) refers to curriculum integration as a way to teach around common problems. Similarly, Meier et al (1998) argue that curriculum integration is an opportunity for students to understand the world they live in by examining real world problems that are not bound by subject specific boundaries. Berlin and Hillen (1994) refer to curriculum integration as a student-directed form of inquiry. Ross and Hogaboam-Gray (1998) report on curriculum integration as the organization of content around a problem or project. For each of these researchers, curriculum integration represents either a method or way of organizing instruction.

In contrast, there are numerous researchers who describe curriculum integration as a range of approaches (rather than a single method). Diem (1996) discusses how curriculum integration may take the form of parallel instruction (teaching related content in different subject areas during the same term) or even blending (using thematic units organized around a central problem or project). Virtue, Wilson, and Ingram (2009) examine the differences between integrative/interdisciplinary (problem or project based) and correlated (links are made between subject areas) instruction, comparing them against a conventional model of instruction (distinct subject areas).
In many studies, the range of approaches referred to as curriculum integration is organized along a continuum. This continuum ranges between recognizing a few connections between subject areas (e.g., parallel instruction, multidisciplinary instruction) to having no clearly identified subjects being taught (e.g., problem or project based inquiry). Berlin and Lee (2005) refer to these differences as the various degrees of integration. In essence, they represent the degree to which subject areas are mixed together. What I find fascinating about the different continuums in existence is that, in many cases, they have been created by the same researchers who have also argued for curriculum integration as its own end result—its own curriculum. This seems a contradiction, arguing for integration as curriculum versus creating different models of integrated instruction.

For example, Alberty and Alberty (1962) present five designs or types of instruction. Type one involves no integration or mixing of subject areas; each subject remains distinct and separate. Type two is based on a correlation; while subjects are taught separately, any relationships between subject areas are clearly shared with students. Type three represents a fusion of related subject areas; this often exists in schools today with social studies (a fusion of geography, history, sociology, etc.) as a prime example. Type four focuses on a reorganizing of curriculum around common problems or areas of interest; while recognizing that the curriculum (organized into subject areas) must be covered, it is organized around common questions or problems. Finally, type five is a complete restructuring (as opposed to reorganizing) of curriculum around teacher-student generated questions; this releases teachers from covering the subject specific curriculum to focus on more local and personal interests/needs of the
class. I would argue that type five results in integration as its own curriculum.

Interestingly, however, Alberty and Alberty discuss type four as their preference, arguing that type five is unrealistic in any age of accountability in education. Teachers still need to be responsible for the set curriculum; while teachers can alter how they teach, there is much less flexibility regarding what they teach.

More recent models of curriculum integration follow a similar, while more simplified, progression as Alberty and Alberty (1962). Drake (1998) and Drake and Burns (2004) describe a three-step sequence for curriculum integration moving from integration solely as a mixing of subject areas to a restructuring of curriculum: multidisciplinary, interdisciplinary, and transdisciplinary. Paralleling Drake’s work, Adler and Flihan (1997) propose a categorization similar to Drake’s: correlated, shared, and reconstructed. Empirically, since that time, in collaboration with researchers such as Arthur Applebee, these later categories have been examined in relation to an increasing number of concepts (including the number of connections made among subjects, the number of minutes spent in open discussion, and the degrees of collaboration) between and beyond the disciplines (Applebee et al., 2007). I now examine these categories of curriculum integration in more detail as I will be referring to them throughout this study.

Classifying curriculum integration for this study

Multidisciplinary or correlated. These types of units recognize disciplines as their own entities with specific knowledge and skills associated with them (Drake, 1998). Typically, teachers plan units by choosing a theme (e.g., transportation, life in the future, etc.), identifying the relevant objectives from each discipline, and planning activities to meet those objectives. These units may still be taught in separate subject blocks (e.g.,
learning centres, complementary, parallel) or grouped together in large time segments (e.g., fused lessons, service learning, thematic); however, the disciplines still remain clearly identifiable. During multidisciplinary units, teachers rarely make reference to different subject areas; instead, these connections remain implicit throughout the unit.

**Interdisciplinary or shared.** These units usually have the lines between each of the disciplines blurred (Drake, 1998). Teachers typically review the curriculum objectives for their class (e.g., looking at the objectives required for grade 2) and look for common themes or big ideas. Ontario’s curriculum documents (Ontario Ministry of Education, 1999) usually refer to these big ideas as enduring understandings. These enduring understandings represent the key concepts for each subject area or discipline. During interdisciplinary units, teachers make the connections between the disciplines more explicit for students, focusing on how knowledge and skills across discipline areas are used together to solve problems both in and beyond the classroom.

**Transdisciplinary or reconstructed.** These units represent the far end of the spectrum; when recognizing disciplines as socially constructed entities, drawing a distinction between disciplines becomes irrelevant. Instead, teachers focus on a problem, issue, or project and ask: What do my students need to know or be able to do to solve this problem, issue, or (complete this) project? These types of units are often referred to as project- or problem-based learning and require a reconstruction of the curriculum (Drake, 1998). These units can also be referred to as synthesized or blended (Applebee et al., 2007). If these units are based on the questions and concerns addressed (or asked) by students, the units are usually referred to as a core curriculum. This idea of the core curriculum being created from student concerns is most strongly associated with the work
of James Beane. Beane (1995, 1997, 2005) advocates the use of curriculum integration as a key tool for implementing a *democratic pedagogy*. He believes that the questions and concerns of students closely align with the big issues facing our world (e.g., global warming, animal extinction, human rights, war and peace, etc.). By investigating these student driven questions and concerns, teachers can help empower a more active citizenry. Students will learn that their concerns have value and by becoming informed and involved, they can make a significant difference in the world. The main challenge with organizing units of study around these student questions is that teachers would need to let go of their focus on curriculum content. Covering the curriculum becomes more of an afterthought than a planning pre-thought (hence the term, restructured curriculum). However, Beane is one of the few theorists to explore the implications of a truly restructured curriculum, making specific connections between curriculum integration and a specific model of citizenship development.

For the purpose of this case study, I will be using Drake’s (1998, 2000) categorization of multidisciplinary, interdisciplinary, and transdisciplinary integration to discuss the implemented practices of my two Beachville teachers. However, while I aim to be clear with regards to how I describe the integration in this case study, I recognize that this categorization scheme may be foreign to my participants. As noted by Grossman, Wineburg, and Beers (2000), while research literature may discuss different types or definitions of curriculum integration, the majority of studies are “almost entirely devoid of descriptions of what actually happens when theory meets school practice” (p. 9). Instead, teachers often view integration not “so much as an intellectual problem, but as a practical solution, a means to increase motivation among students” (p. 7).
Recognizing this divide between research examining curriculum integration and integration as it appears in classrooms, I now focus on descriptions of integration in practice. Following this examination of practice, I then provide a brief review of Canadian curriculum references to curriculum integration. As noted by Alberty and Alberty (1962), it is extremely challenging to move beyond the content of the curriculum as written; this may place limits on the type of curriculum integration (or the view of integration as curriculum) engaged in by teachers. Consequently, I believe that it is important to examine the current, mandated curriculum.

**Research Regarding Curriculum Integration**

Currently, research examines teacher perspectives of curriculum integration, describes implemented integration, and/or discusses student learning. In very few studies are all three of these aspects discussed. Instead, only one or two of these aspects are covered. Given that my research questions focus on these different aspects, I focus on these three areas separately (although they are related), recognizing that I may reference the same study more than once. In each reference, this will be noted.

**Teacher perspectives**

Research that shares and/or discusses individual teacher perceptions of curriculum integration is rare. Instead, most studies detail why the article’s authors are interested in researching curriculum integration. These interests are varied as the following examples illustrate: examining the use of technological process as a way to integrate curricula (Johnston, 2005), focusing on the development of an information-processing model through integration (Nuthall, 1999), examining transfer, motivation, and learning focus (Ross & Hogaboam-Gray, 1998), and discussing what counts as meaningful learning in
an integrated context (Venville, et al., 2003). The majority of research papers that did describe teacher perspectives regarding curriculum integration focused on the notion of relevance. For example, in Czerniak’s (2004) study of an integrated unit on wetlands, the teachers said that they wanted to “focus on [the] personal and social concerns that interest adolescents and young adults” (p. 3). They wanted to ensure that the content they were teaching in their classrooms was relevant to the students they were teaching; they saw integration as an opportunity to accomplish this goal. Similarly, Weilbacher’s (2000) examination of reasons why teachers chose to implement curriculum integration focused on wanting to “make learning real to students” (p. 168).

Hargreaves et al. (2001) interviewed 29 teachers (grades 7 and 8) regarding their perspectives and experiences using curriculum integration in subject-specific schools. Participants shared that they chose to integrate curricula to ensure that what they were teaching was meaningful for their students. They focused on relevance in relation “to work, to personal development and relationships, and to social and political contexts” (p. 87). In many cases, these teachers involved members of the community—linking life inside the classroom to life outside the classroom. However, the middle school teachers in the Hargreaves et al. study also noted that “the strong subject focus in secondary school runs contrary to many seventh- and eighth-grade teachers’ efforts to integrate the curriculum and develop cross-curricular skills through it” (p. 109). Drake (2000), when summarizing issues in curriculum integration, noted that “elementary school teachers often perceive themselves as ‘teachers who teach kids,’ while high school teachers perceive that they teach disciplines” (p. 53).
In elementary schools, teachers have more control over their time than high school teachers. Often responsible for teaching a single group of students for the entire year, the elementary school teacher may have designated gym, library, computer lab, and prep times, but the rest of the schedule is quite flexible. If an elementary teacher chooses to teach using themes (e.g., from morning to recess and from lunch to the end of school, teaching a unit on Spring that involves language arts, science, and art) rather than subject specific times (e.g., language arts in the morning, math after recess, and science or social studies after lunch), there are no restrictions. In contrast, high schools are routinely organized around subject areas, with students moving from one teacher to another, changing classrooms while they change subject areas. High schools also work on a semester system, with different subjects and groupings of students changing three to four times in the year. A high school teacher wishing to implement an integrated unit would need to coordinate with other teachers, possibly rearrange timetables, and alter year plans. This added challenge for planning and scheduling are pertinent to this case study. As reviewed later in this chapter, provinces in Canada organize their curriculum outcomes by subject areas, with high school teachers required to cover a great deal of subject-specific content in specific time blocks.

In other studies, teachers provided a variety of reasons for incorporating curriculum integration in their classrooms. Bintz et al. (2006), for example, discuss results from the observations of 27 grade six students and their teacher as they worked through an integrated unit with students building and testing a rubber-band canon. The teacher chose to be involved in the study to “help middle school students (a) think like mathematicians and scientists, (b) develop specific areas of expertise in math and science,
and (c) use literature as a tool to learn across the curriculum” (p.31). In another study, Diem (1996) described how 16 teachers at a secondary school implemented integrated units around key social studies’ themes (e.g., civil war). These teachers were specifically interested in trying to increase parental involvement and student literacy in their grade 9 students. In addition, Brodhagen (1998) discussed teacher reasons for implementing integrated curricula and her participants focused on involving students in organizing curriculum so as to develop a stronger democratic community. These motivations are consistent with Beane’s (1995, 1997, 2005) view of integration as a democratic practice.

Interestingly, in each of the aforementioned studies, teacher perspectives focused on why they chose to implement an integrated unit rather than what they believed integration was. In other words, a discussion of deeper, theoretical questioning seems absent. This brings me to a discussion of how integrated units are usually planned and implemented.

*Implementation of curriculum integration*

As noted in the introduction, Applebee et al. (2007) focused on the categorization of correlated, shared, and restructured curriculum. In their study, Applebee et al. examined “11 interdisciplinary teams in two [USA] states” (p. 1007). Through “extended interviews with teachers, administrators, and students, classroom observations, collection of program artefacts…and collection of as much of the written work completed by [6] focal students” (p. 1010), Applebee et al. compared the amount of cross-disciplinary activity, individual teacher practices, and classification schemes for curriculum integration. They found a correlation between their classification scheme and both cross-disciplinary activity and teacher practice. For example, there was generally an increase in
the amount of student collaborative activity and student-directed questions when comparing correlated, shared, and reconstructed units (with reconstructed units showing the highest levels of student collaboration and student-directed questions). It is important to note, however, that this increase was affected by individual teachers; regardless of the unit, some teachers used more collaborative activities than others. Similarly, as reported in Adler and Flihan’s (1997) review of literature related to curriculum integration, the majority of teachers who chose to utilize integrated units, regardless of categorization, had “student-centered, collaborative classrooms that were frequently project and/or discussion based” (p. 14). There is some additional evidence to support this statement.

Several articles in my review focussed on the implementation of thematic units. For example, Czerniak (2004) described a series of activities around a wetlands unit. Each of these activities was implemented separately, while using the wetlands as an overall theme. In a further example, Nuthall (1999) described a high school unit on Antarctica, including descriptions of activities and student discussions around an information-processing model. The activities were loosely connected around the common Antarctic theme. Finally, Diem (1996) examined several social studies’ units (e.g., Civil war, holocaust, etc.) designed to increase student literacy and parental involvement. While these units involved teachers from a number of disciplines, the social studies’ skills took precedence throughout the unit—it was this content that connected the units, not the activities themselves.

Another popular approach to integration involves project-based units. Typically, under this approach, similar to Applebee et al.’s (2007) restructured curricula, teachers independently teach each discipline area (teaching the requisite content and skills) and
then follow these lessons with independent projects that require students to apply their knowledge and skills. For example, Bintz et al. (2006) had students build a rubber band cannon; Johnston (2005) detailed students building a mousetrap car; and, Venville et al. (2003) described pairs of students building solar powered boats. Ross and Hogaboam-Gray (1998) discussed seven different application projects, each taking place after disciplinary units had already been completed, investigating what transfer of knowledge (if any) took place.

Some studies did not describe the type of integration used, but instead focused on teachers’ concerns when implementing integrated units. For example, Flowers et al.’s (2003) review of middle school research in integrated classrooms identified that teachers needed a minimum of 30min common planning time to implement an effective integrated unit. Flowers et al. also found that the ability of teams to work together on integrated units improved over time. Hargreaves et al. (2001) echoed these findings, adding that, of all the subjects, mathematics was the hardest to integrate given its specialized knowledge (in contrast, English, history, geography, and science were the most frequently integrated subjects). These authors also raised an additional concern about whether students learn as much, or better, through integrated units as opposed to discipline-centred classrooms.

**Student learning**

Before examining results with regards to student learning during integrated units, I will briefly examine what is meant by student learning in my study. Learning is a complex idea with definitions that vary across disciplines (e.g., a focus on critical thinking in a social studies’ classroom to deductive logic in a mathematics course) and psychological theories (e.g., cognitive theory, constructivism, etc.). However, “research
on basic learning processes also demonstrates the difference between successfully storing information in memory and being able to retrieve and use it later on” (Bransford, Darling-Hammond, & LePage, 2005, p. 23). In other words, recognition is quite different from retrieval. Recognition occurs when someone can remember what a movie is about when given the title—when a cue or context is provided. For teachers using a written test or quiz, including multiple-choice questions, matching, and true/false questions act as mechanisms for recognition; the answer is there, students just need to be able to identify it. In contrast, retrieval can occur without prompting. On a written quiz, having open-ended response questions that require students to generate their own answers without prompts would be an example of retrieval, also referred to as recall.

In contrast, Gardner and Boix-Mansilla (1994) take recall or retrieval to a higher cognitive level by requiring students to apply knowledge to new or different situations. “Genuine understanding has been achieved if an individual proves able to apply knowledge in new situations, without applying such knowledge erroneously or inappropriately; if he or she can do so spontaneously, without specific instruction to do so” (p. 200). Ross and Hogaboam-Gray (1998) refer to this as knowledge transfer—the ability to use information in new situations. This focus on application is a more complex thinking task than simply recalling knowledge to answer an open-ended question. Simple recall can be achieved by describing a situation the student has already experienced whereas transfer requires a student to apply the knowledge they acquired in that first situation to something new and different.

This brief discussion regarding the concept of learning is pertinent to research examining student learning in an integrated unit. In many articles, learning is used as an
umbrella term to include results in relation to recognition, retrieval/recall, application, and/or transfer of knowledge. While these are all very different ways for students to demonstrate if they have acquired (or can use) knowledge from a classroom activity, they are rarely specifically identified in research examining student learning during integrated units. To further complicate what is understood as student learning, integration literature often also refers to engagement, and/or motivation as either aspects or examples of student learning. This makes it challenging to summarize research regarding student learning and curriculum integration.

For example, Berlin and Hillen (1994) report results from a project designed to integrate math and science in middle school (i.e., over 2000 students in grades four to six). The teachers identified the curriculum objectives that students were taught in a series of integrated units. However, the study’s results focused on an increase in attendance and engagement and did not report on specific learning outcomes. Bintz et al. (2006), reporting on student learning from the previously identified rubber band cannon unit, shared that students were engaged, but no records of student achievement were reported. Flowers et al. (2003), when reviewing a number of middle school studies examining the challenges and successes of integrated units, reported that, effective teachers with common planning time resulted in the “higher implementation of best practices and a positive impact on student outcomes, including emotional health and behaviour and student achievement” (p. 58). However, no examples or descriptions of this reported “student achievement” were included in their article.

In each of the aforementioned articles, the focus was on student motivation and engagement more than recognition or retrieval/recall. In contrast, there are a few studies
that focus specifically on recognition and retrieval/recall. For example, Nuthall (1999), while researching an integrated unit on Antarctica (noted in previous sections) found that students were “successful remembering when three to four experiences (on the same content) with no more than a two day gap” (p. 326). Nuthall noted that students were able to “remember”—whether this is referring to recognition or retrieval/recall is unclear; however, the word “remember” is at least in reference to learning rather than motivation.

Another study that focused on learning was conducted by Ross and Hogaboam-Gray (1998). These researchers used both an experimental and a control group to test whether being involved in project-based tasks (e.g., building a tower with spaghetti and marshmallows) could increase students’ ability to apply their knowledge in a new situation. Their results were quite interesting. While students in the experimental group were better at applying what they learned in new situations, there was no difference on the academic tests completed by both groups (whether those tests focused on recognition, retrieval/recall, and/or application remains unclear). Ross and Hogaboam-Gray found that while integration improved students’ problem solving abilities, it did not assist their capacity to retrieve disciplinary knowledge and apply it to a new situation. It is unclear if the problem solving was a skill that had been taught and was then being tested or a separate observation. Ross and Hogaboam-Gray concluded that, “the kind of integration chosen is more important than whether or not to integrate” (p. 1133). Consequently, Ross and Hogaboam-Gray focused on application or transfer of knowledge rather than just recognition or retrieval/recall.

Another interesting set of results came out of the Venville et al.’s (2003) study of year nine students working through the design and testing of a solar powered boat. Their
study revealed that the disciplinary knowledge students had been exposed to prior to the project was not utilized effectively by students. Instead, to build the boat, students used a great deal of trial and error. As a result, rather than reinforcing scientific principles, students just tried until something worked—then they were satisfied because their boat operated successfully. Consequently, Venville et al.’s study demonstrated a lack of direct application of scientific principles—whether this means that students were able to recognize or retrieve/recall information at a later time is unclear. This example adds strength to Ross and Hogaboam’s (1998) caution about the importance of understanding the relationship between the type of integration and the consequences for student learning while also demonstrating limitations that exist when student learning is not clearly defined.

For the purpose of this study, I avoid the general term of student learning given the broadness with which it can be interpreted. Instead, I specifically refer to recognition, recall, and application of knowledge. I am also specific (i.e., fourth research question) with regards to how student knowledge was assessed and evaluated by both teachers and myself. Consequently, I report on evaluations of student academic performance as a phenomenon that can be observed and described.

Having reviewed these categorizations of curriculum integration, I now focus on how curriculum integration is discussed in educational policy documents. As already noted, the purpose for including this discussion regarding policy references to integration is to identify whether curriculum integration is supported politically. Is there such a thing as an integrated curriculum…integration as an end result? I then focus on the level of support provided to teachers (e.g., integrated or discipline-specific learning outcomes to
aid assessment, suggested activities to ease planning, or list of resources to support planning and implementation) who choose to implement curriculum integration as a method of instruction.

*Examining Policy References to Curriculum Integration*


In Canada, provincial reference to curriculum integration is mixed across provinces/territories, subject areas, and grade levels.

To examine these variances I reviewed provincial/territorial Ministry references to curriculum integration at the elementary and secondary levels for English Language Arts (as the largest curricular area), Social Studies, and Science (as these are the subject areas under examination in my case study). All provincial/territorial curricula documents are available on-line via each Ministry website. After accessing the curricula documents for each province/territory, subject area, and level (e.g., elementary and secondary), I conducted three separate searches. First, I reviewed each Table of Contents for sections related in anyway to curriculum integration. Second, I read through the introduction of each document (often containing the philosophical foundations of that subject area and level) for any reference to curriculum integration or like term. Finally, I conducted
electronic document-wide searches for the following terms: integration, integrated, and connections. I describe my review below.

**Western Canada and the North**

Since 2006, BC, Alberta, Saskatchewan, Manitoba, the Yukon, the Northwest Territories, and Nunavut have been members of the Western and Northern Canadian Protocol for Collaboration in Education (WNCP). The WNCP is “a partnership of provinces and territories with a mandate to provide quality education for all students from Kindergarten to Grade 12 through collaboration in educational programs and services” (WNCP, 2006, p. vii). As such, each western province and northern territory is in the process of revising all curriculum documents in collaboration with the WNCP. However, how each province utilizes and implements these recommendations vary depending on the province or territory as well as the subject area. As such, I will look at each independently.

**BC and the Yukon.** At present, the Yukon follows the BC curricula. In BC, the elementary curricula are quite distinct from that of secondary. At the elementary level, curriculum integration is explicitly referenced and encouraged with specific reasons for supporting curriculum integration included in the document. For example, in one of the foundation documents for the elementary program, the following reference is made to curriculum integration:

…children need opportunities to see connections among them. To achieve this, teachers may integrate thinking and communicating processes across the curriculum and use a variety of approaches to integrate the curriculum. The main purpose of curriculum integration is to enhance students’ learning and the making of thoughtful connections. Thus, teachers may choose to integrate two or more subjects (such as mathematics and the visual arts) or may include all or most curriculum areas, depending on their purpose and context. (BC Ministry of Education, 2000, p. 70)
Curriculum integration is then further elaborated on, providing descriptions of theme, project, learning style, intelligence orientation, knowledge framework, literature base, and genre based integration. In contrast, at the secondary level (grades 8 to 12), curriculum integration is referenced sparingly.

For example, in Language Arts, integration is referenced as a caveat recognizing how universal the skills of reading, writing, listening, and speaking are to other subject areas: “Because of its universality, language allows students to make connections across many areas of study. Integration must occur between English Language Arts and other curriculum areas” (BC Ministry of Education, 2007, p. 16). However, for Science, integration is only referenced in relation to Aboriginal content, English as Second Language (ESL), and students with special needs (BC Ministry of Education, 2008). For Social Studies, curriculum integration is recognized as a necessity given the subject area—Social Studies is considered a mixture of subject areas and, as such, requires organization into “curriculum organizers” (BC Ministry of Education, 1997, p. 6).

*Alberta and Nunavut.* Alberta documents are consistent. Throughout all elementary and secondary documents, for Language Arts, Science, and Social Studies, there is no mention of curriculum integration. Currently, “Nunavut generally follows Alberta’s secondary school system but is working to develop its own system founded on the principles of Inuit Qaujimajatuqangit” (Government of Nunavut, 2008b, p. 2). Qaujimajatuqangit refers to traditional Inuit knowledge and the importance of integrating that traditional knowledge with all aspects of education and society. With the passing of the Education Act in 2008, the Department of Education has put forth a timeline for implementation of their own curricula by 2020 (Government of Nunavut, n.d.). The
Education Act, by “recognizing the relationship between learning and language and culture, and the importance of the curriculum and school programs being developed and delivered accordingly” (Government of Nunavut, 2008a, p. 1), describes a curricula designed around similar principles to those of curriculum integration. However, those curricular documents have not yet been implemented and are, therefore, not reviewed here.

Saskatchewan. Saskatchewan, similar to BC, has inconsistencies in relation to references to curriculum integration. The Language Arts document makes reference to integrating within the discipline only (e.g., reading, writing, speaking, and listening). For Science, Saskatchewan provides very specific planning directions for its elementary school teachers.

Patterns may exist which allow teachers to group Core Units together. This is particularly important when integration between subjects takes place. Once the Core Units are planned, any Optional Units or thematic units that will be covered should be considered. Alternately, thematic units could be planned first. Then the objectives from the Core and Optional Science Units, as well as objectives from other subject areas, can be integrated. (Saskatchewan Ministry of Education, 1990, Unit Planning, para 2).

In contrast to elementary science, within the junior (grades 8 – 10) and secondary (grades 11 – 12) curricula, there is no reference to integration. Alternatively, for Social Studies, curriculum integration is strongly encouraged throughout different levels. Unique to any province, the Social Studies 9 curriculum discusses transdisciplinary integration—emphasizing the incorporation of more than one subject area for the purpose of applying what is learned in school to life outside the classroom.

Teachers and students can begin their inquiry at one or more curriculum entry points; however, the process may evolve into transdisciplinary integrated learning opportunities, as reflective of the holistic nature of our
lives and interdependent global environment. It is essential to develop questions that are evoked by student interests and have potential for rich and deep learning. These questions are used to initiate and guide the inquiry and give students direction for investigating topics, problems, ideas, challenges, or issues under study. The process of constructing questions for deep understanding can help students grasp the important disciplinary or transdisciplinary ideas that are situated at the core of a particular curricular focus or context. These broad questions lead to more specific questions that can provide a framework, purpose, and direction for the learning activities in a lesson, or series of lessons, and help students connect what they are learning to their experiences and life beyond school. (Saskatchewan Ministry of Education, 2009, p. 17).

Manitoba. As with BC and Saskatchewan, Manitoba also demonstrates diversity in its references to curriculum integration. No reference is made to integration in either the elementary or secondary English Language Arts curricula. However, for Science and Social Studies, brief nods are given to integration in very specific ways. In elementary Science, the Manitoba Education and Training department (1999b) recognizes that “learning does not happen in isolation…Using an integrated approach allows teachers to make the connections between the acquisition of skills and real world applications across the curriculum” (p. 23). As such, curriculum integration is viewed broadly as a way of keeping classroom activities connected to the real world. However, in secondary Science (Manitoba Education and Training, 1999a), the value of curriculum integration is more specifically linked to two subject areas: Mathematics and English Language Arts. In addition, some discussion is included regarding curriculum integration as an authentic assessment tool. In Social Studies, curriculum integration across the disciplines that make up Social Studies (e.g., history, geography, sociology, etc.) is referenced, with an additional mention that, “Social Studies teaching offers the ideal opportunity to integrate literature and the arts, and to use information and communication technologies” (Manitoba Education and Youth, 2003, p. 5). Beyond these notes in the overall
philosophy of Manitoba’s Social Studies curriculum, no specific examples of how to integrate Social Studies’ curriculum outcomes across other subject areas are included.

**Northwest Territories.** The Northwest Territories is in the process of drafting new curricula for all subject areas and, via this process, is utilizing curricula from the WNCP, Alberta, and Manitoba. For English Language Arts, the Northwest Territories is using the WNCP recommendations and is applying it across elementary and secondary grades. Within the introduction of each English Language Arts curricula document, curriculum integration is first recognized as an important aspect within the “six language arts: listening, speaking, reading, writing, viewing, and representing” (Northwest Territories, 2006, p. 17). Second, curriculum integration is recognized as a strong aspect of planning in general:

> Students and teachers set goals and make plans to support student achievement. Their plans reflect the learning outcomes of many curricula. Through a variety of instructional approaches, the Learning Outcomes (LO) are not kept separate and distinct; rather, many are integrated into all learning experiences, reaching beyond the language curriculum. (Northwest Territories, p. 17)

However, similar to Manitoba and BC, these philosophical notes in support of curriculum integration remain only in the introduction section of each curricular document. At no time are specific curricular outcomes in English Language Arts integrated across subject areas.

For Science, the Northwest Territories uses the Alberta curriculum and there is no mention of curriculum integration. The Northwest Territories’ Social Studies curriculum is based on the 2005 Manitoba draft curriculum for the WNCP. For kindergarten to grade 6, the curriculum encourages integration within the subject area itself and makes explicit links to the English Language Arts.
Social Studies has very similar goals for itself, and the relationship between these two subject areas can provide rich opportunities for integration which foster student learning in ways that each subject area cannot achieve alone. As teachers become familiar with the connections between many ELA and social studies outcomes, it is anticipated that student learning will be more cohesive, and the overall class time needed to explore these outcomes will be significantly reduced as they are addressed in an integrated way instead of separately. (Northwest Territories’ Department of Education, Culture, and Employment, 2008, p. 3)

This document also includes two appendices which link specific English Language Arts and Social Studies’ curricular outcomes for both planning and assessment purposes. The development of a similar document for secondary Social Studies in the Northwest Territories is underway.

**Ontario**

In Ontario, the location of my study, curriculum integration is referenced differently depending upon the grade and subject area. In English Language Arts, grades 1 to 8, curriculum integration is strongly encouraged throughout the introduction to the subject area.

The study of language and the acquisition of literacy skills are not restricted to the language program, and this curriculum promotes the integration of the study of language with the study of other subjects. Examples are used throughout this document that illustrates ways in which teachers can achieve this goal in the classroom. (Ontario Ministry of Education, 2006, p. 5)

The examples referred to above are provided in a four-paragraph section titled “Cross-curricular and integrated learning” (pp. 23 – 24). In this section, English Language Arts are described as tools for the other subject areas: “Students need well-developed language skills to succeed in all subject areas” (p. 23). This section briefly describes how the reading of non-fiction material lends itself to Social Studies, using oral and written
communication to share findings in Science, and the use of dramatic performance in the Fine Arts. The body of the Ontario Language curriculum (grades 1 to 8) provides curricular outcomes with no references to how specific Language outcomes relate to other subject areas. For grades 9 and 10, the Ontario Language curriculum contains no mention of curriculum integration in either the outcomes or the introduction (Ontario Ministry of Education, 2007a).

In the Ontario Science curriculum for grades 1 to 8, curriculum integration is supported in the document’s introductory sections.

Fundamental concepts are key ideas that provide a framework for the acquisition of all scientific and technological knowledge. They also help students to integrate scientific and technological knowledge with knowledge in other subject areas, such as mathematics and social studies. (Ontario Ministry of Education, 2007b, p. 5)

For grades 9 and 10, there is a reference to the importance of integrating environmental education into all aspects of the Science curriculum (Ontario Ministry of Education, 2008). It is important to note that all Science curriculum documents refer to both Science and Technology. If one views Technology as its own discipline, the very nature of Ontario’s Science and Technology curriculum may be considered integrated in nature (similar to English Language Arts representing the integration of reading, writing, speaking, and listening).

There is no mention of curriculum integration in the Social Studies curricula for grades 1 to 6 (Ontario Ministry of Education, 2004). However, for grades 9 and 10 (referred to as Social Sciences and the Humanities), curriculum integration is discussed in the introduction.

The discipline of social sciences and the humanities has connections with many other disciplines taught in secondary school, on the level of both
knowledge and skills. Studies in social science and humanities courses will allow students to bring a broader perspective to their learning in subjects such as history, geography, and English. Students will be able to build on previous learning, integrate related knowledge, and apply learning skills across subject areas. Subject matter from any course in social sciences and the humanities can be combined with subject matter from one or more courses in other disciplines to create an interdisciplinary course. The policies and procedures regarding the development of interdisciplinary courses are outlined in the interdisciplinary studies curriculum policy document. (Ontario Ministry of Education, 1999, p. 3)

As the above excerpt illustrates, curriculum integration is referenced in two different ways. First, curriculum integration within the Social Sciences (e.g., history, language, geography, etc.) provides students with the opportunity to develop a broader perspective. Second, if the Social Sciences were to be integrated with other disciplines, an interdisciplinary course can be created. The Interdisciplinary studies curriculum policy document referred to in the excerpt is designed to guide schools and school districts in the creation of interdisciplinary courses at the grades 11 and 12 level (Ontario Ministry of Education, 2002). The purpose of interdisciplinary studies, as noted by this document, is to provide students with an “increased marketability in a variety of careers” (p. 4).

Our world is increasingly interconnected and interdependent. Communications’ networks exchange information around the globe, creating new forms of collaboration and transforming the nature of work and learning. New areas of study develop to advance human knowledge and respond to the challenges of our changing world with insight and innovation. These include areas that often combine or cross subjects or disciplines, such as space science, information management systems, alternative energy technologies, and computer art and animation. (p. 3)

However, while the interdisciplinary studies curricula outline how schools and school districts may create an integrated course for grades 11 and 12, no theory, outcomes, or examples are provided for teachers regarding how to integrate curricula within specific subject areas.
The Atlantic provinces

In Atlantic Canada (New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland), all four provinces have collaborated to develop a common curriculum in all subject areas. In English Language Arts, primary grades, there is no reference to curriculum integration. However, in the grades 7 to 9 curricula (Nova Scotia Department of Education and Culture, 1997), it is noted that “it is important, wherever possible, [that] learning in English language arts be connected and applied to learning in other subject areas” (p. 100). This note connects to a one-page Appendix (E) where integration is defined as “a natural overlap among subject areas and when students can see the relevance and the interrelatedness of curricula” (p. 170). In this Appendix, curriculum integration is described as needing a “collaborative partnership [whereby] colleagues share ideas about a theme. The unit can last for several days or it can be a school project that lasts for several months” (p. 170). A special note is made that “effective integration…ensure[s] that the skills, strategies, and knowledge components of each discipline are respected and deliberately included, since there is potential for one discipline’s agenda to override or dilute another’s” (p. 170). This definition is consistent with a multidisciplinary or correlated view of integration whereby the disciplines are viewed as natural and distinct entities. However, similar to most provincial curriculum documents, there are no integrated outcomes or examples in the English Language Arts curriculum.

In Science, integration in grades 1 to 8 is not mentioned. Instead, curricula documents discuss the value of making links. However, opportunities for links are referenced only within a specific time frame. For example,
Follow-up time can also be an ideal time to link to other subject areas with science. This could include, for example, reflection on prior activities in math such as measurement or data management, a shared or read-aloud experience related to the activity during language arts time, or an art activity. The science activity should not be an activity done for the sake of an activity. Discussion and links to other areas are key to students’ continuing to view learning as an integrated whole. (Nova Scotia Department of Education and Culture, 2006, p. 4)

In grades 7 to 12, integration, is viewed as a way of “assisting students as they attempt to make connections across topics in science or between science and the real world” (Nova Scotia Department of Education and Culture, 2003, p. 25). In this sense, integration is not discussed across subject areas, not even as a follow-up activity. Similarly, in Social Studies, curriculum integration is not mentioned in grades 1 to 8 (e.g., Nova Scotia Department of Education and Culture, 1999), neither is it described as a within subject area (e.g., integrating history and geography in Social Studies) opportunity in grades 9 to 12 (e.g., Nova Scotia Department of Education and Culture, 1998).

A Canadian summary

While there are variations in how provincial and territorial curricula documents refer to curriculum integration, I will attempt a few modest generalizations. First, nowhere is curriculum integration explicitly discouraged. If referenced, integration is encouraged at both the primary and secondary grades. Second, when referenced, the value of integration focuses on helping students make sense of real world problems by revealing connections between or within subject areas (e.g., history and geography are disciplines contained with the subject area of Social Studies). In many ways, these references are similar to the emphasis Drake (2000), Johnson (2002), and Venville et al. (2000) place on the development of interdisciplinary thinking as a way of solving problems. Third, the majority of references made to integration reflect a multidisciplinary
approach (with the exception of the Saskatchewan Grade 9 Social Studies curriculum
describing a transdisciplinary approach). Distinctions are made between subject areas,
and disciplines are treated as natural entities. As such, all curricula (with the exception of
the interdisciplinary studies option for Ontario students in grades 11 and 12) remain
separated into subject areas, with no mention of integrated curricular outcomes (e.g.,
student demonstrates use of deductive reasoning [Science outcome] when problem
solving social situations). Fourth and finally, with the exception of the Northwest
Territories providing an appendix table showing matches between English Language Arts
and Social Studies, no examples in planning or assessment are provided for teachers
interested in the integration of curricula at either the primary or secondary level.

This overview is noteworthy given that my study examines a secondary school in
Ontario. The two teachers in my study were interested in implementing curriculum
integration in their classes and while the Ontario curriculum supported their efforts in
theory, they received little support. In Canada, teachers interested in curriculum
integration are required to research, plan, implement, and assess their own units
independent of provincial or territorial support. This is further complicated by having
PLOs attached to specific subject areas; evaluation of student work during an integrated
unit may be challenging as the PLOs must be reported separately rather than together.

Chapter Conclusion

Having reviewed policy documents, theoretical frameworks, and research
examining integration in practice, I provide a brief chapter review organized around my
four research questions.
My first research question examines teacher perspectives and understandings of curriculum integration. A review of existent literature reveals two findings. First, in many studies researcher perspectives (or categorizations) of integration are presented rather than teacher perspectives. Second, when teacher perspectives are reported, the focus is on why teachers chose to implement an integrated unit (e.g., increase relevance of classroom activities, prepare students for work outside the classroom, strengthen literacy skills, etc.). This focus on why teachers implemented an integrated unit highlights the absence of teacher voices when discussing the numerous classifications and descriptions of curriculum integration. In addition, at no time do teachers appear to discuss the complexity of curriculum integration as either method or end result. Whether my two Beachville teachers are even aware of this variance will be interesting.

My second research question focuses on the issues and challenges experienced by teachers. As previously discussed, at the secondary level, the subject specific organization of teachers and classrooms often results in challenges when trying to implement an integrated curriculum. This may be a challenge for the two teachers in my study given that they are members of a secondary school divided up by subject area. An additional concern that may arise involves the evaluation of student knowledge. As described in my review of Canadian policies, academic objectives are organized by subjects as well. Consequently, it will be interesting to note if assessment and evaluation of student performance is a challenge for these two teachers.

My third research question focuses on student perspectives regarding their participation (hopefully learning) in an integrated setting. As noted earlier, most reported measures are based on teacher perspectives (e.g., feeling students were more engaged or
involved) or researcher observations (e.g., measures of on/off task behaviour, attendance, etc.) rather than student perspectives. In addition, the focus is usually motivation or engagement with regards to the entire unit. I have been unable to find discussions of student perspectives of integration. It will be interesting to compare, in this study, student perspectives regarding activities (integration as a method of instruction) versus their perspectives regarding integration (integration as curriculum); are they the same or different?

My fourth question focuses on issues related to student academic performance—a more specific focus and description of what I am measuring than the broadness associated with the term student learning. My aim is to be clear with regards to the type of learning (e.g., recognition, recall, or application) as well as the type of assessment and evaluation. Therefore, for this question, I focus specifically on academic (as opposed to motivational or socio-emotional) performance. In addition, as the objectives these two teachers identified do not include problem solving abilities, this skill is not considered an academic objective. In this way, I aim to identify whether students were academically successful and attempt to relate that to the integrated practices implemented in this unit.

Having reviewed the research literature in relation to my four research questions, I now focus on comprehensively describing my methodological choices as they relate to my questions.
Chapter Three: Research Design

My aim for chapter three is to comprehensively describe the methodology and methods for my study so that readers are clear on how I gathered, analyzed, and reported on this integrated energy unit. This will hopefully enable readers to evaluate my ability to address concerns of legitimatization, representation, and praxis when investigating my four research questions:

1. What are these two teachers’ perspectives and understandings regarding integration curriculum?
2. What are the issues and challenges faced by these two teachers as they implemented an integrated unit together?
3. What are the students’ perspectives on learning in this integrated setting?
4. How do students perform academically in this integrated setting and what are the issues related to this performance?

As such, I detail my research methodology and methods, including background on participants, a description of data collection and analysis techniques, and a discussion of validity issues and study limitations.

Research Methodology...Why a Case Study?

As noted in chapters one and two, research examining curriculum integration rarely provides information regarding both student academic performance and the nature of the integrated unit itself. Studies do not seem to report comprehensively on integration from start (reasons for teachers wanting to plan and implement integration) to finish (including detailed reports on student academic performance). As noted in a literature review of curriculum integration, Adler and Flihan (2007) remark that, “missing from
almost all of the research is an in-depth study of how the classroom interactions
progressed to the assessment stage” (p. 15). Consequently, this broadness, encompassing
all aspects of the integrated unit and its participants, is an overarching goal for this study.

As noted by Creswell (1998) and Stake (2000), the key component of a case study
is a detailed description of the case and its setting. The boundaries of the study are
determined by the concept or event under investigation. This case study is bounded by
the planning, implementation, and evaluation of an integrated energy unit. Case study, as
a methodology, focuses on stretching out to cover every boundary resulting in a broad
data base; everything within those boundaries represents data to be considered.

The methodological freedom of case study (Stake, 2000), with its focus on the
question rather than the use of specific methods, provides the freedom to examine
multiple perspectives using multiple types of data. In my study, I aim to examine teacher,
student, and researcher perspectives. Do we see or understand different things…or the
same things? Given my need to broadly cover this integrated unit from multiple
perspectives, case study is the best methodological choice when seeking to answer my
four research questions regarding teacher and student perspectives, unit implementation,
and academic performance.

*Intrinsic or instrumental case study?*

As summarized by Stake (1995), there are three different categories for case
studies: intrinsic, instrumental, and collective. While a collective involves more than one
specific case study, intrinsic cases arise when a particular case is of interest. Creswell
(1998) detailed an intrinsic case study which described a school shooting and how
students and teachers tried to return to a sense of normalcy. This individual incident was
of particular interest; a school shooting such as this was unique. It was complicated and had a huge impact on everyone involved. This was of interest to Creswell and he conducted an intrinsic case study to examine this unique case.

In contrast, an instrumental case study is useful when understanding a concept. Examples of instrumental case studies would include making friends, grieving, student motivation, student assessment, and, in this case, integration. The focus for the researcher is using a specific case to better inform the academic community about a concept. The instrumental case emerges from “a puzzlement, a need for general understanding, and [as such] feel that we may get insight into the question by studying a particular case…this use of case study is to understand something else” (Stake, 1995, p. 3). For me, I am using the boundaries of this integrated energy unit to study and further my understanding of integration. As a result, this is an instrumental case study, aiming to better inform research and teaching practices in relation to curriculum integration.

Recognizing researcher biases

When completing a case study, the researcher may take on many roles—evaluator, interpreter, teacher, biographer, etc. (Stake, 1995). However, one role will be the most predominant. For my study, my primary role is as interpreter. In this way, recognizing a lack of information regarding a topic (in this case, curriculum integration), I seek out “new connections…and [find] ways to make them comprehensible to others” (Stake, p. 97). When establishing these new connections I am required to observe participants and their environment and interpret these observations in light of the concept I am researchin.
participants, their environment, and me. Consequently, it is important to be as transparent as possible with my assumptions and expectations.

When looking at other aspects of methodology in relation to myself as researcher, Tashakkori and Teddlie (1998) identify four researcher assumptions worthy of disclosure: ontology (nature of reality), epistemology (relationship of the knower to the known), axiology (role of values in inquiry), and causal linkages. Ontologically, I believe in multiple realities based on individual perceptions. In this sense, I am a constructivist: I believe “that knowledge, whether private or public, is a human construction” (Wildy & Wallace, 1995, p.145). Consequently, I aimed to gather perceptions from a variety of participants, not in an effort to find the truth, but instead, to shed as much light on curriculum integration from as many different perspectives as possible.

Epistemologically, I believe that both the knower and the known influence each other; we are not separate and independent, but more interdependent. As such, I recognize my involvement in constructing the description and findings of this case study. From an axiological point of view, I believe that my values, expectations, and assumptions will influence my research. As a result, it is critical that I am as transparent as possible with regards to my assumptions. I try to make my contributions as visible as possible to readers and take time throughout my research to reflect on my assumptions (Wallace & Louden, 1997).

Finally, in reference to my assumptions regarding establishing cause and effect; that is not my aim with this study. I believe that, in any situation, there are too many factors involved in determining cause and effect. Instead, I aim to comprehensively describe and interpret this implementation of curriculum integration so as to provide
connections for other researchers and teachers interested in using curriculum integration. Case study, with its emphasis on description, is congruent with my assumptions and aligns with my research questions and, as such, is the most logical method for my study. I now focus on identifying the participants involved, data sources, data analyses, and validity checks.

Setting and Participants

As part of a larger study examining curriculum integration in a variety of middle and high school settings, I first obtained ethical approval from the University of Toronto. Then, using recommendations from the University of Toronto preservice program supervisors (to identify those schools most likely to be utilizing curriculum integration), I circulated a request for teachers interested in being involved in a study of curriculum integration. I was then contacted by a grade 9 teacher at Beachville, Ms. Wade, who then introduced me to her colleague, Mr. Norris. I then obtained consent from the school district, the school administrator, the teachers involved, and the students and their parents. While I gathered data regarding the classroom as a whole to provide information on how the integrated energy unit was implemented, I identified 8 students for intensive observation and interviewing (choosing 8 of the 23 students represented a manageable data load for myself). These students were selected in consultation with both classroom teachers to ensure a variety of academic levels, cultural backgrounds, and gender. As a result, this case study utilizes a purposeful, representative sampling technique (Teddlie & Yu, 2007) because my participants were selected to provide “instances that are representative or typical of a particular type of case on a dimension of interest…to achieve comparability across different types of cases” (Teddlie & Yu, p. 80). Throughout
the unit, 1 of the 8 students did not demonstrate consistent attendance, resulting in too little data to include him in my analyses. As such, in this report, I discuss intensive observations and interviewing of 7 students.

Beachville public school is a secondary school servicing over 900 students from grades 9 to 12 in one of Canada’s largest public school boards. I followed the two teachers in separate classrooms: Ms. Wade taught grade 9 science and Mr. Norris taught grade 9 geography. Typical of most Canadian secondary schools, the students moved from classroom to classroom, usually having four or five different classes in a day. I followed one group of grade 9 students for a five week period of time in the Spring of 2008, attending their science and geography classes (a total of 25hrs at the school involved in either classroom observations or interviews). Ms. Wade was the first of the two teachers to express an interest in teaching an integrated unit. She noted that Mr. Norris had the same group of students scheduled in the same term and, recognizing a shared content related to energy resources and conservation, approached Mr. Norris with the idea of teaching a joint integrated unit. Mr. Norris agreed, realizing how rare it was to have the courses scheduled in the same term.

It is fortunate too that we got the timetable as it stands right now. By altering our timetables slightly we can actually hit the same thing at the same time cause there’s some overlap in the course. But, generally I’m teaching something at the beginning of the year that you [referring to Ms. Wade] might be teaching in January…so it’s hard. (c3, ITI, p8)

Both teachers had taught their respective disciplines for a number of years; however, this unit was the first time either of them had tried implementing an integrated unit.

Both the geography and science class were designated as Applied. In Ontario, Applied courses “focus on the essential concepts of the discipline, but develop students’

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2 ITI: Initial Teacher Interview; FGI: Final Geography Interview; FSI: Final Science Interview
knowledge and skills by emphasizing practical, concrete applications of these concepts and incorporating theoretical applications as appropriate” (Ministry of Ontario, 1999, p. 14). The Applied classes, as opposed to Academic classes, aim to prepare students for trade schools, workplace preparation courses, and colleges; Academic courses aim to prepare students for university entrance. At Beachville Secondary, parents and students work with guidance counsellors to choose either an Applied or Academic stream.

The development of Applied courses emerged out of a 2003 provincial report of the At-risk Working Group which had been requested by Ontario’s Minister of Education to develop “specific recommendations of what should be done to mitigate…concerns of at-risk students” (Ontario Ministry of Education, 2003a, p. 4). This report, implemented as a “Pathways to Success” document defined at-risk students as:

1. elementary students who are performing at level 1, or below grade expectations;
2. secondary students who would have studied at the modified or basic level in the previous curriculum;
3. secondary students who are performing significantly below the provincial standard, earning marks in the 50s and low 60s, and who do not have the foundations to be successful in the new curriculum;
4. students who are disengaged for a variety of reasons, which tend to be reflected in very poor attendance. (Ontario Ministry of Education, 2003b, p. 14)

As described in this Pathways document, at-risk students could be placed in a school-work transition program pathway which included the incorporation of Applied courses to support student success and future employment (Ontario Ministry of Education, 2003b). Beachville offers Applied courses as part of this province-wide initiative to meet the needs of at-risk students. The majority of students within our case study were teacher
identified as at-risk (meeting three of the four aforementioned criteria). Ms. Wade shared that she had read that at-risk students found integrated units more motivating; she wanted to see if this group of students would experience the same benefits.

Data Sources

Having briefly introduced the participants, I now focus on the data sources for this study. I start with a description of the schedule and overall objectives for the energy unit. I then describe the sources of data gathered before, during, and after the unit. These descriptions will reference specific tools provided in my Appendices.

The integrated unit Ms. Wade and Mr. Norris chose to implement was a science and geography unit on energy. Ms. Wade and Mr. Norris taught science and geography respectively and independently. Students attended these classes on a rotating schedule. For example, students had science on Monday-Wednesday-Friday while they attended geography on Tuesday–Thursday. This arrangement was reversed on alternate weeks. In geography, it was planned for students to study different types of energy sources, the pros and cons of each, and where these sources were available in Canada. In science, students were to examine how energy travelled to their homes in the form of electricity, learn about electrical circuits, and expand their knowledge of energy conservation. The entire unit spanned 16 lessons over five weeks.

Having introduced this energy unit for both geography and science, I now focus on specific data sources. To answer my four research questions, I gathered data before, during, and after the implementation of this integrated energy unit.
Pre-unit data collection

I collected two main sources of data prior to the start of this integrated unit; both were interviews. These interviews, similar to the interviews used throughout this study, would be defined by Fontana and Frey (2000) as a type of unstructured interview; I worked from a set of open-ended questions designed to have my participants describe their experiences and perspectives. According to Stake (1995), interviews provide “multiple views of the case,” enabling researchers to move beyond his or her own observations. My primary data source was a 56min interview with Ms. Wade and Mr. Norris. I audio recorded and had this interview transcribed. The guiding questions for this interview (please see Appendix A) focused on each teacher’s beliefs about integration, their expectations for the forthcoming unit, and how they planned to assess student performance. Both teachers shared what they felt was important, why they chose to teach using integration, and goals that they had beyond the academic curriculum (if any). Both teachers discussed their own teaching philosophies and provided details of specific teacher practices and pedagogical expectations for the forthcoming unit. I placed special emphasis on having these teachers identify the key academic outcomes for their unit and used these key outcomes to construct my pre-unit interview questions for students. In addition, I incorporated these outcomes into the observation record (to allow tracking of when certain outcomes were addressed in the classroom). During this initial interview, teachers shared their social and academic expectations for the pre-selected students.

The second data source involved separate, 5 to 10min interviews with each of the seven pre-selected students (please see Appendix B for the interview protocol). I audio recorded and had all interviews transcribed. The aim of these interviews was to have
students describe what they thought integration was and their expectations about the upcoming unit. Finally, I posed questions related to the key academic outcomes identified in the initial teacher interview. Student responses provided an indication of their understanding of the concepts to be covered in the unit, providing starting points for the tracking of student learning and perspectives.

_During-unit data collection_

The unit was completed over 16 classes and I was present for each lesson. My primary role during these visits was to gather observations of teacher and student behaviours and describe the classroom environment. I was also responsible for initiating spur-of-the-moment mini-interviews with participants (see below).

During these visits, I completed observation records (see Appendix C) that included the following information: (a) every five minutes all seven pre-selected students were coded as on- or off-task; (b) every five minutes I coded all seven pre-selected students according to the type of behaviour (i.e., talking with other student, observing, handling materials, working independently) they were engaged in; and, (c) descriptive written records of teacher instructions, teacher behaviours (e.g., assisting students, working independently on computer), general observations of student behaviours (e.g., noting when individual students volunteered an answer), notation of classroom interruptions (e.g., public announcements, interruptions from other teachers), and comments regarding the noise levels or overall class level of on-task behaviour. As a result, this observation record is an example of “intramethod mixed observation” (Johnson & Turner, 2003, p. 313) as it enabled the simultaneous collection of qualitative
(e.g., descriptive written record) and quantitative (e.g., a priori on- and off-task codes and behaviour codes) data.

At the conclusion of each visit, I completed an independent observation reflection to: (a) provide a brief overview of that visit, (b) identify any salient features unique to that visit, and (c) identify observer subjectivities and critical questions. In this way I hoped to identify any of my own biases throughout the unit. These observation reflections are similar to a “reflexive journal” (Tashakkori & Teddlie, 1998, p. 93).

In addition to the above, I audio recorded all small group discussions and problem solving sessions (for the pre-selected students). I transcribed these recordings into what I refer to as running records. These running records contain both word-for-word transcriptions (notated in quotation marks), as well as sentence descriptors of extraneous information (e.g., talking about last night’s dance). Also, throughout the unit, I conducted occasional mini-interviews with students and teachers. These interviews were audio recorded and transcribed. I initiated mini-interviews (usually 2 to 5min each) for a variety of reasons: (a) to reveal teacher perspectives regarding how an activity went and how they would alter it or build on it in the future; (b) to provide clarification about teacher philosophies and student expectations; and (c) to enable students to share what they were thinking while engaged in a task.

Post-unit data collection

After the unit concluded, I conducted semi-structured final interviews with both teachers. At Beachville, the geography classes finished before the science lessons. As a result, I had two final interviews—one after geography finished (43min) and one when science finished (35min). Please see Appendices D and E for the respective interview
protocols. The aim of these interviews was to have teachers comment on specific aspects of the unit. As such, these interviews were more structured than the initial interviews. My questions focused on the following aspects: (a) for each of the key outcomes identified in the initial interview, I asked teachers to describe any evidence for identifying whether or not an individual student had achieved that outcome; (b) using photographs to stimulate memory recall, I asked teachers to rate the value, relevance, level of student enjoyment, and effectiveness of a number of specific activities using a 4-point Likert scale (1 = strongly disagree, 4 = strongly agree); (c) I asked teachers to comment on successes, challenges, and future alterations that they would make to the unit; and, finally, (d) I asked teachers to reflect on their use of integration and share whether their perspectives regarding integration had changed or remained the same and why.

I also conducted individual 35 to 40min interviews with each of the pre-selected students (see Appendix F for the interview protocol). These interviews contained both open-ended and closed-ended questions, representing a type of mixed interview (Johnson & Turner, 2003, p. 306). The aim of these interviews was two fold: to gather student perspectives regarding the unit and to examine their ability to recall knowledge related to the academic outcomes of the unit. As such, in the first half of the interview I asked students to answer a series of Likert-scale questions, similar to those asked of the teachers (see (b) above), allowing a comparison of responses. I used photographs to elicit memories of specific activities and students then rated how relevant, useful, motivating, and effective they perceived each activity to be. After each of these closed-ended rating scale questions, I asked students to elaborate or explain why they chose each rating. In addition, I also asked students to discuss their perspectives regarding curriculum
integration. The second half of the interview involved a series of knowledge and skill testing questions designed to assess each student’s ability to recognize and recall academic knowledge in relation to the unit outcomes. I asked students to explain their answers and elaborate on when and how they felt they learned the knowledge or skills required to answer each question.

Data Analyses

Given the large amount of data I had accumulated by the end of my observations and interviews, my primary focus during data analyses was two-fold. I needed to condense my data while at the same time ensuring that I did not lose the voices of my participants. Consequently, using my pre-, during-, and post-unit data, I completed a description and an analysis. First, I completed a “detailed description of the case and its setting” (Creswell, 1998, p. 153). Second, I completed a thematic analysis to “concentrate on relationships identified in [my] research questions” (Stake, 1995, p. 77). I detail each of these steps below.

Description of the case

“If the case presents a chronology of events, then I recommend analyzing the multiple sources of data to determine evidence for each step or phase in the evolution of the case” (Creswell, 1998, p. 153). As noted in my introduction and literature review (chapters 1 and 2 respectively), I found a lack of description in research examining curriculum integration. To address this concern, I gathered data on teacher perspectives regarding integration before and after they taught their integrated unit. To gather data on student perspectives and performance, I conducted pre- and post-unit interviews. This automatically created a chronology of events: before, during, and after the unit. To
expand on this chronology, during the unit, both teachers referenced specific learning outcomes which framed the sequence of their unit. Mr. Norris started with looking at different energy sources (e.g., traditional and alternative, renewable and non-renewable); Ms. Wade then began looking at the path of electricity from source to home; Mr. Norris completed his geography unit by looking at energy sources in Canada; Ms. Wade then had students examine energy conservation in the home and build their 3D model.

Consequently, the chronology of events I describe in chapter four is as follows:

1. Before the Unit;
2. During the Unit;
3. Energy sources;
4. Getting electricity home;
5. Energy in Canada;
6. Conserving energy;
7. Building our model home; and,
8. After the unit.

For each of the aforementioned events, I reviewed all data (i.e., interview transcripts, observation records, mini-interviews, group work transcripts, and student work) with the aim of describing each event from a variety of perspectives. For example, when describing the activities regarding energy sources in Canada, I examined data from three perspectives: (a) Using my observation records I have a third-party interpretation of these lessons; (b) using any mini-interviews with Mr. Norris in the moment, as well as teacher reflections on each event from the post-unit interviews, Mr. Norris provided his perspective on these lessons; (c) finally, using any student mini-interviews and group work transcripts in combination with student reflections on these lessons, I gathered student perspectives as well. By describing each event with data from a variety of viewpoints, I provide the most comprehensive description of each aspect of the unit, as well as teacher perspectives and student academic performance.
**Thematic analysis**

After completing a description of the case, I began my thematic analysis. Within an instrumental case study, the purpose of thematic analysis, also referred to as categorical aggregation, is to “help us understand phenomena or relationships within it” (Stake, 1995, p. 77). These relationships are pertinent to identifying those issues or themes that may be relevant to future implementations of curriculum integration. As noted by Ryan and Russell Bernard (2000), “researchers induce themes from the text itself” (p. 780). For this case study, my induction focused on my four research questions.

For my first question, examining teacher perspectives and understandings of curriculum integration, I reviewed all interview transcripts from both teachers before, during, and after the unit. As I read through, I looked for words or ideas that continually emerged from the transcripts. For example, in interviews before and after the unit, Mr. Norris kept referring to reinforcement. He wanted concepts to be reinforced in both classrooms to increase student retention. In contrast, Ms. Wade kept referring to real life and solving life problems. Each teacher talked about these ideas repeatedly in more than one interview. Another example in relation to my first research question focused on the value of using curriculum integration with Applied classes. In both post-unit interviews, as well as mini-interviews throughout the unit, Mr. Norris and Ms. Wade repeatedly shared how they felt curriculum integration was really important for at-risk students in order to maximize student success. Due to the reoccurrence of these ideas, they became themes to report (see chapter five).

I included these two examples to demonstrate the broadness with which I coded the data. I looked for ideas, words, or comments that emerged more than once, whether
by both teachers or before and after the unit—both were acceptable. After reviewing the data in relation to teacher perspectives and understandings, I reviewed the codes that had emerged. This then led to my secondary thematic analyses: could any of these codes be combined to form a more comprehensive theme? For example, while Mr. Norris discussed reinforcement and Ms. Wade discussed solving life problems, both of these represented purpose behind choosing to integrate. Consequently, my theme became *purpose is important to teachers*, with two aspects: *integration provided reinforcement of concepts* and *integration helped students solve life problems*. After combining into appropriate themes, I then returned to my literature review to identify any ways to link each theme to existing literature. In this way, I aimed to keep my thematic analyses rooted both in my research questions as well as current research.

I repeated this same process of identifying repeated comments, ideas, or concepts; combining into larger themes when appropriate; and, linking to research for each of my four research questions. For my second question, examining teacher perspectives in relation to issues and challenges, I used teacher interview transcripts from before, during, and after the unit. These two questions are analyzed in chapter five. For my third question, examining student perspectives regarding their participation in an integrated unit, I used interview transcripts, my observation records, and transcribed group work conversations. For my final question, examining evaluations of student academic performance, I compared student interviews before and after the unit as well as teacher quizzes. These two questions are analyzed in chapter six.

Once I completed my thematic analyses for all four questions (i.e., coding repeated ideas, comments, concepts; grouping into appropriate themes; and linking
themes to literature), I reflected back on my analyses in relation to my overarching goal of comprehensively describing an integrated unit from start to finish. I asked myself: by doing this, what did I learn overall? Was this of value? Why? How can future researchers and teachers use this comprehensive description to improve their own best practices? This then resulted in my summary chapter seven. I then concluded with a brief examination of study limitations. These limitations were derived from concerns regarding legitimation, representation, and praxis identified in this chapter on research design.

*Addressing Legitimation, Representation, and Praxis*

It is the researcher’s responsibility to address issues regarding what is traditionally referred to as validity. However, how researchers define or address validity is quite varied (for an attempt at describing these variations, see Creswell, 1998, p. 200). However, Creswell prefers to “use the term verification instead of validity because verification underscores qualitative research as a distinct approach, a legitimate mode of inquiry in its own right” (p. 201). Verification can be strengthened through member checks, prolonged observations, and data triangulation, among others. Denzin and Lincoln (2000) have structured their view of verification as the “triple crisis of representation, legitimation, and praxis” (p. 17). I have planned in specific strategies throughout my research study to address these three issues.

*Issues of legitimation*

According to Denzin and Lincoln (2000), the crisis of legitimation asks: “How are qualitative studies to be evaluated in the contemporary, post-structural moment” (p. 17)? The focus is on trustworthiness: how can we trust the subjective writings of a researcher
to capture an accurate picture of the case? To address concerns regarding legitimation, I incorporated the following strategies throughout:

1. I made persistent and prolonged observations in the field to gather sufficient data to add to the credibility of my study. For this case I spent 25hrs in the field gathering information from a number of sources.

2. I recorded data accurately so if colleagues or other researchers need to reference back to my data for a specific point of clarification, that reference is easily found. To ensure this, my textual data, pictures, and observation records are kept and labelled according to time and location in a single binder.

3. I gathered data from different perspectives (third person observer, teacher, and student) to enable a more comprehensive description of the case.

**Issues of representation**

The issue of representation has become a concern, particularly for qualitative researchers, as it is now recognized that “qualitative researchers can no longer directly capture lived experience” (Denzin & Lincoln, 2000, p. 17). In many cases, the gathering of data into manageable chunks or themes reduces the data—which at the same time may reduce the clarity of participant voices. To address this need to maximize opportunities for the participants’ voices to be heard, I implemented the following procedures:

1. I used member checks to discuss my interpretations of the data with the participants of my study. I shared my data and interpretations with my participants on an ongoing basis.

2. I identified my researcher biases (e.g., regarding participants, setting, intervention, and the research process itself). I began addressing my personal bias in chapter three to provide additional clarity.

3. When writing the report, I included many direct quotes from data sources and attempted to make my writing as accessible to the reader as possible.
Issues of praxis

The issue of praxis extends from the previous two issues: “is it possible to effect change in the world if society is only and always a text” (Denzin & Lincoln, 2000, p. 17)? The focus with this issue relates to how researchers and practitioners can use information from this study to affect their own practice. To address this concern, I implemented the following procedures.

1. I included specific discussions to provide a structured review of all data analyses with the key focus of identifying overall suggestions for guiding the larger field of curriculum integration.

2. I compared my findings with the current research literature to determine how my study both supports and contributes to other research studies.

Chapter Summary

Having discussed the methods I will be using to verify my findings and conclusions, I now briefly review possible study limitations. As an instrumental case study (Stake, 1995), I aim to provide a detailed description of teacher perspectives, unit implementation, and student academic performance during an integrated unit on energy. The purpose of an instrumental study is to illuminate themes and concepts regarding curriculum integration that can be useful for other researchers and practitioners. However, no cause and effect relationships have been tried and tested, no variables controlled; this is not an evaluation of curriculum integration but a study that provides comprehensive descriptions that can be reviewed, pique interest for other researchers and teacher practitioners, or provide a possible insight or opportunity to try something new in a different classroom. Any transferability from this case depends on how others read the case and how the particulars of this case may speak to other teachers and schools in
similar circumstances. In addition, I hope to inform the research community about ways of conducting research into curriculum integration.

Reviewing chapter three, I described my case site, Beachville Public School, in detail. I provided an overview of the integrated energy unit implemented by Ms. Wade and Mr. Norris and their Applied grade 9 students. As I have described my data sources (i.e., teacher and student interviews, classroom observations, transcripts of group discussions, and examples of student work) and data analyses (i.e., case description and thematic analysis), I now focus on reporting my findings. Chapter four provides a detailed description of this integrated energy unit at Beachville.
Chapter Four: Case Description

Introduction

As noted in chapter three, Beachville is a public school in one of Canada’s largest school districts. I followed Ms. Wade, Mr. Norris, and 23 students as they completed a sixteen lesson energy unit in their Applied science and geography classes. In this chapter I provide a comprehensive description of what happened before, during, and after the unit.

Before the Unit

Prior to the implementation (actual teaching) of the energy unit I conducted interviews with both teachers as well as seven students. During the teacher interview, Mr. Norris and Ms. Wade described the learning outcomes for this unit (as required by the Ontario Ministry of Education curriculum, see Table 1), the sequence they were planning for the unit, and the pre-selected students I would be focusing my observations on throughout the unit. Mr. Norris was very clear about the geography foci he had for his part of the energy unit. He was in the process of finishing a larger unit on resources in Canada (e.g., fishing, forestry, mining, etc.) and the examination of energy sources was going to culminate this comprehensive examination of resources.

Norris: We’ll look at conventional energy and alternative sources of energy and that’s where the overlap will be, if we time it right, we should be at right around the same time that you [Ms. Wade] are

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3 Throughout the remaining chapters, quotes from teachers and students will be used. The following acronyms are used to ensure that the location of each quote is both transparent and manageable: (a) ITI = initial teacher interview completed with both teachers prior to the unit, (b) FGI = final geography interview completed with both teachers after the geography, but before the science, activities had concluded, (c) FSI = final science interview completed with both teachers at the end of the entire unit, (d) [student pseudonym] pre = a specific student’s pre-unit interview, (e) [student pseudonym] final = a specific student’s post-unit interview, (f) res = researcher (myself), and (g) obs[#] = identifies which observation days (numbers 1 to 16) a quote occurred. Each of these codes will be followed by a page number reference in the corresponding transcript.
finishing up with electricity, so we’ll be talking conventional, as in nuclear, hydroelectric and gas powered generators and stuff like that, then we’ll go into…

Wade: Renewable resources…

Norris: Alternate, like wind, tidal and stuff like that, so for us, my purpose is, the purpose of the geography is to talk about the effect it will have on Canadians and where it’s available. I think the main objective that we’re going to have, sorry bear with me…types of energy, where they’re available in Canada, and the pros and cons, those are the three objectives that we’re to try; those are the three things. That will tie in; especially where they’re available and pros and cons will sort of apply. (ITI, p. 5)

Table 1: Unit objectives by subject area

<table>
<thead>
<tr>
<th>Geography Objectives</th>
<th>Science and Technology Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>G1: types of energy sources and how they are classified (i.e., renewable, non-</td>
<td>S1: path of electricity from source to home</td>
</tr>
<tr>
<td>renewable, alternative, and traditional)</td>
<td></td>
</tr>
<tr>
<td>G2: pros and cons of different energy sources</td>
<td>S2: electrical circuits</td>
</tr>
<tr>
<td>G3: locating energy sources in Canada</td>
<td>S3: energy conservation</td>
</tr>
</tbody>
</table>

Responding to Mr. Norris’ comments regarding the sequence of the unit, Ms. Wade began to describe how she would parallel the work being done in the geography class.

Yeah it would be around the same time, the information on the energy part, cause I do have to teach them about electrons and that stuff…I don’t know, because what I might do, I could actually even teach it kind of backwards, and I could teach them a little bit about where energy comes from, because I would like them to be able to actually draw or physically make something that shows it coming from lets say a windmill or a hydro station with power lines into a house, like I need them to make that connection and once it gets into the house how does it end up working? Then I can go into parallel series circuits…. (Wade, ITI, p. 15)
At the time of the initial interview, while neither teacher had completed any unit or lesson plans, by the end of the interview, Mr. Norris and Ms. Wade had developed a rough schedule for the flow of activities (see Figure 1). Mr. Norris was going to begin first with types of energy (including pros and cons) and Ms. Wade was going to follow with pathways from energy sources to homes. Mr. Norris would then address where energy sources were located in Canada and Ms. Wade would continue by looking at electricity in the home. Ms. Wade would then conclude the unit with her final project.

<table>
<thead>
<tr>
<th>Types of Energy</th>
<th>Path of Electricity</th>
<th>Energy in Canada</th>
<th>Energy Conservation</th>
<th>Building a Model Home</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 1: Progression of energy unit over 16 observation days

Having reviewed the unit and their objectives, Mr. Norris and Ms. Wade then identified seven students for interviews and focused observations. Table 2 presents an overview of these seven students. This overview includes information regarding gender (four males, three females), any designations (e.g., English Second Language or learning disabilities), level of attendance during the unit (from perfect attendance to missing six of sixteen lessons), level of on-task behaviour throughout the unit, as well as brief descriptive notes. I have included this table in chapter four to provide the reader with a brief snapshot of the range of students selected for observation. In addition, throughout
my description of the case, individual students will be referred to; this table provides a context for these references.

My brief initial interviews with each student revealed that the majority of students had no idea what integration was or how it related to their geography or science classrooms. In addition, with the exception of Daniel, the pre-selected students were unable to accurately answer questions related to the unit’s objectives (e.g., unable to identify different energy sources in Canada or explain how electricity travelled through a simple circuit).

Having overviewed the interviews completed prior to the start of the unit, I now focus on describing the activities implemented in the geography and science classrooms for this energy unit.

Table 2: Brief overview of pre-selected students

<table>
<thead>
<tr>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peter</td>
<td>Leah</td>
</tr>
<tr>
<td>➢ On-task 83% of the time</td>
<td>➢ On-task 96% of the time</td>
</tr>
<tr>
<td>➢ Consistent attendance</td>
<td>➢ Perfect attendance</td>
</tr>
<tr>
<td>➢ “I told Peter that he should be going for Academic Social Studies…he’s doing everyone else’s notes in class” (Mr. Norris, FSI, p. 11)</td>
<td>➢ “Leah is hard to read because she is so quiet” (Ms. Wade, FSI, p. 12)</td>
</tr>
</tbody>
</table>

---

4 As explained in chapter three, while observing each lesson, I coded each of these seven students as on- or off-task every five minutes. If students appeared engaged with a lesson (e.g., looking at the speaker, working with materials, asking/answering questions, and/or discussing lesson content), I coded them as on-task. Off-task behaviour included doodling, talking about something other than lesson content, and/or staring off into space. It is important to note that these percentages represent calculations based on my perception of students’ behaviour. It is possible that a student appeared off-task, but was paying attention to lesson content, or that the reverse was true.
Ryerson
- On-task 73% of the time
- Consistent attendance
- Designated with numerous learning disabilities
- Prone to off-task talking in class
- Last to complete all written quizzes

Jamie
- On-task 78% of the time
- Consistent attendance
- “…a smart kid [who] shouldn’t even be in the Applied” (Mr. Norris, GFI, p. 5)
- Prone to off-task talking in class

Daniel
- On-task 84% of the time
- Repeated absences (missing 6 of 16 lessons)
- Described as an “insecure” student who “should be in academic” (Ms. Wade, FSI, p. 11)

Krista
- On-task 81% of the time
- Perfect attendance
- Concerned with appearing “stupid”

Abram
- On-task 99% of the time
- Consistent attendance
- Designated English Second Language (ESL)

During the Unit

For the 16 lessons of the energy unit, students alternated each day between their geography and science classrooms. For geography classes, students were on the third floor of the school with Mr. Norris. For science classes, students were on the second floor of the school with Ms. Wade. There were no times when these classes overlapped each other, and at no time did Ms. Wade or Mr. Norris observe each other teaching this unit.

As discussed in detail in chapter five, these teachers did not meet throughout the implementation of the unit (with the exception of their interviews with me). Throughout the unit, my primary role was as observer. I kept detailed observation records throughout each lesson, observing teacher and student behaviours. During group work, I ensured that audio recorders were placed with the seven students I was focusing on for my
observations. During group work, I periodically asked questions from these seven students to clarify a response or perception I had observed.

After each lesson I would briefly talk with either Ms. Wade or Mr. Norris (depending on who had been instructing). During these discussions I sometimes asked for clarification regarding the lesson. I was also sometimes asked to share some of the observations I had made of the other lessons (e.g., Ms. Wade would ask how things were going with Mr. Norris’ lessons). At that time I would provide a brief review of the lesson content; this represented the only opportunity for Ms. Wade and Mr. Norris to learn about the activities going on in each other’s classrooms.

Mr. Norris and Ms. Wade each taught their respective learning outcomes in five activities (or sections): energy sources (geography), getting electricity (science), energy in Canada (geography), conserving energy (science), and building a model home (science). I elaborate on each of these activities below.

Energy sources

The first activity occurred in Mr. Norris’ geography class. This examination of traditional (thermal, nuclear, and hydroelectric) and alternative (solar, wind, and tidal) energy sources occurred over two lessons (1st and 4th observation days). On the first day, Mr. Norris used a student booklet he had put together which provided detailed notes and a few questions related to traditional energy sources. Using an overhead projector showing different energy sources, Mr. Norris led a class discussion examining the benefits and challenges of thermal, nuclear, and hydroelectric power. Throughout this discussion, numerous students gave examples of different neighbourhood uses of power. For example, Niagara Falls was mentioned in relation to hydroelectric power. Mr. Norris
also included numerous local examples of how Ontario utilized these sources. For example, nuclear power was delivered to Lower Ontario from Uranium City and details on current city council initiatives to build a thermal plant not far from the neighbourhood. After this discussion, students worked independently to answer the questions on their worksheets. After completion of the worksheets, students then had to draw three symbols, each representing one of the three traditional energy sources. These symbols were to be used later in a mapping activity. Consequently, Mr. Norris instructed students to make their symbols appropriate for use on a map legend.

The next geography class (day 4), Mr. Norris worked through alternative (solar, wind, and tidal) energy sources. Similar to the previous class, students were given a teacher-made resource booklet with worksheets and detailed notes, an overhead was used to provide visual examples, and a whole class discussion examined the benefits and challenges of each. This discussion was then followed by independent student work to complete the questions in the booklet and create three additional symbols for each of the three resources.

The whole class discussion on alternative energy sources again emphasized real life examples that related to students’ lives. For example, many of the students had seen large wind turbines in Toronto and named several businesses in town that had installed solar panels (e.g., a laundromat) to assist with energy costs. In some cases, students also brought information they had heard in the news.

*Getting electricity home*

The second activity in the energy unit occurred with Ms. Wade in science class. This activity focused on teaching students how electricity made it to students’ homes in a
useable form. I observed this activity being taught over five different class periods (observation days 2, 3, 5, 7, and 8). It started just after Mr. Norris’ energy sources activity and continued in parallel, alternating with geography classes, until the conclusion of the third activity (energy locations in Canada, G3). Please refer back to Figure 1 for an illustration of this observation schedule.

During this activity, Ms. Wade focused on three things: the physical path required to get energy from a source (e.g., hydroelectric plant along transmission lines to a distribution centre to power lines to transformers to home meters, etc.), turning energy into a useable form (by looking at power and circuits), and electrical safety. To cover these three areas, Ms. Wade utilized a variety of methods.

For the first lesson, Ms. Wade showed students a PowerPoint presentation with many pictures illustrating how energy travelled from a given extraction point to their homes. Also included in this PowerPoint were numerous short YouTube clips demonstrating how different distribution centres and meters worked. Ms. Wade then had students visit the electrical room in the basement of the school as well as take a walk around the outside of the school to identify different objects related to electricity. While on this walk around school property, Ms. Wade gave students a number of disposable cameras to take pictures of what they saw. There was some confusion regarding the heating system for the school as well as the telephone boxes leading to many questions from students and some whole class discussion. Upon returning to class, students had a brief brainstorm regarding which electrical appliances/toys they would miss the most if they no longer had electricity.

For the second lesson, Ms. Wade aimed to practice what students had learned the
lesson before. After being placed in groups of four, students were given copies of the pictures they had taken before, as well as some additional pictures from the internet. Groups were required to put the pictures in order showing how electricity travelled from its source to their homes. Groups were to add in descriptive text as well as any hand drawn pictures of objects that may have been missing. While students were working on their strips, Ms. Wade circulated, asked questions, and corrected any mistakes. Groups then took turns presenting their strips to the rest of the class.

For the third lesson, Ms. Wade moved from discussing the path electricity travelled to get to our homes to looking at electrical circuits—electricity in a useable form. She distributed wires, light bulbs, and batteries to pairs of students. She posed the following question: what do you need to make electricity flow? Students had to first make a prediction and then experiment with the materials; no one knew the answer. Students tried a number of possibilities. The greatest challenge was actually working with the light bulbs themselves. After students struggled for about 10min, noting the problems they were having with the light bulbs, Ms. Wade drew a picture of the inside of the light bulb on the board. This picture illustrated how the side of the light bulb and the bottom of the light bulb were connected inside via a wire. Consequently, students needed to have a wire connected to the side of the light bulb and the battery and then have the bottom of the bulb connected to the other side of the battery.

After approximately 5min, pairs of students began experiencing success. There was a great deal of excitement in the room as light bulbs began lighting up. Students then had to draw their circuit on a worksheet. The lesson then concluded with Ms. Wade identifying alternative names for their materials (e.g., battery = source, light bulb = load,
wires = conductors) and having students quickly brainstorm different uses for electricity (e.g., heat energy, kinetic energy).

For the fourth lesson, Ms. Wade used a visual example of water flowing through a funnel to illustrate the concepts of current and resistance. Students then worked independently with the textbook, completing questions on current, resistance, and voltage. Students found the textbook very difficult to understand. Many questions arose regarding the difference between voltage and resistance. To provide an alternative demonstration of resistance Ms. Wade had all students play a game of follow the leader, moving quickly through the science lab. She then put stools in the way (representing resistance) to illustrate how the current slowed down.

On the fifth and final lesson Ms. Wade focused on electrical safety in the home. She gave a lecture on electrical safety, followed by a worksheet for students to complete individually. Given the problems students had experienced the day before, Ms. Wade took students through the first question, modelling how to locate the answer in the textbook. During this time, students shared a number of personal stories related to experiences with electricity (e.g., shocks from outlets, etc.). The lesson concluded with a brief video on electrical safety.

*Energy in Canada*

The third activity in this energy unit involved Mr. Norris and occurred during geography classes. This activity focused on teaching students where to locate specific energy sources (e.g., nuclear, hydroelectric, tidal, etc.) in Canada. I observed this activity being taught over two class periods (observation days 6 and 9).
During the first lesson dealing with energy sources in Canada, Mr. Norris reviewed the conventional and alternative energy sources and provided a brief amount of time for students to complete their worksheets. Mr. Norris then chose six different symbols (from the examples that each student had made in previous classes) to be the legend symbols for each energy source. These legend symbols were being used on a large class map of Canada that Mr. Norris had drawn on the wall (approximately 4ft high and 7ft long) of the classroom. Mr. Norris then gave students their own individual maps (8.5 by 11 inches). Using their completed worksheets, Mr. Norris instructed students to: (a) fill in the map (with an appropriate title, legend, etc.), (b) label the provinces and capitals, and, (c) draw the appropriate symbols in correct locations throughout Canada. Students found this very challenging, most being unsure how to locate the required information from their worksheets. Mr. Norris asked those students who were off-task to add specific details to the large class map (e.g., asking Jamie to label the provinces). Once each student completed their assigned task on the large map, they were much more focused when they returned to their individual work. However, a review of the individual maps around the room revealed several students spending a great deal of time making their map look neat with appropriate labels with only a few students focusing on where energy sources were located in Canada.

On the second (and last class) devoted to energy sources in Canada, Mr. Norris had students use information from their individual maps to place larger energy source symbols on the large class map. After having students identify the locations of each energy source, the pre-made legend symbols were glued onto the large class map. This resulted in having students engaged in a variety of tasks, both at their desks and at the
large map. During this period of mixed activity, the thermal energy source symbols were inadvertently missed and not included on the final class map. Mr. Norris then had students work independently through a series of review questions on the board by looking at the worksheets in their resource booklet. Mr. Norris then quickly reviewed the answers to these questions orally (while the questions were written on the board, the answers were not). Mr. Norris then covered up the class map, erased the questions from the board, and distributed the energy test to students. The amount of time required for students to complete the quiz ranged from 10 or 15 min to 24 min (by Ryerson who rushed through the last few questions). The quiz included a variety of short-answer questions related to identifying the pros and cons of different energy sources; identifying whether an energy source was conventional or alternative, renewable or non-renewable; and identifying where specific types of energy sources could be found in Canada.

Conserving energy

The fourth activity in the energy unit involved Ms. Wade and the science class. This activity focused on the conservation of energy. I observed this activity being taught over a period of four lessons (observation days 10, 11, 12, and 13).

The first two lessons on conserving energy built on students’ understanding of current and resistance and their experiences with building a series circuit. After a small whole class discussion on switches and the flow of electrons, students completed a quick worksheet using the textbook for support. In small groups of four, students then built their own series circuit. Ms. Wade then gave each group an ammeter and a voltmeter. Using these two measuring devices, students recorded measurements from around their
circuit (examining the use and measurement of power—to later be related to the power meter used at home).

During the next lesson, Ms. Wade continued working with circuits. After some brief textbook reading and questions, Ms. Wade gave a demonstration on how to set up a series and parallel circuit. Students were then instructed to return to their desks and draw what they had just observed on a worksheet that included a couple of questions. This was followed by a short discussion on electricity and power, relating power to current multiplied by voltage. Finally, Ms. Wade demonstrated how to draw a series and parallel circuit using science symbols. Students were then instructed to draw a circuit diagram for their bedroom.

On the third lesson dedicated to conserving energy, Ms. Wade had students involved in a number of whole class discussions sharing different ways that each of them could help conserve energy at home. Most student responses focused on closing doors and turning appliances off. Students then had a couple of worksheets to complete with assistance from the textbook. Next, Ms. Wade had students make predictions regarding which times of year (and which appliances) used up the most electricity. Emphasis was placed on recurring blackouts in Lower Ontario during the summer months, noting that the continuous running of air conditioning units used up much more electricity than turning on heaters in the winter. Students also discussed the use of Bullfrog—an organization in Alberta and Ontario which enabled homeowners (and businesses) to choose to get their energy from a renewable source.

On the fourth and final lesson dedicated to conserving energy, Ms. Wade asked students to form groups to brainstorm a minimum list of 10 different ways they could
conserve energy in their homes. Ms. Wade told them that “group work [was] important because we can share our ideas” (obs13). Discussions regarding on-demand heating occurred, with Ms. Wade asking Abram to comment on his experiences with on-demand heating in Europe. Ms. Wade then distributed a worksheet containing electricity problems (related to the calculating of power = voltage x current).

**Building our model home**

The fifth and final activity in the energy unit involved Ms. Wade and the science class. This activity focused on applying the knowledge students had learned from all four previous activities (geography included). I observed this activity being taught over a period of three lessons (observation days 14, 15, and 16). After placing students in small groups, Ms. Wade instructed each group to look around the science room to find materials they could use to construct a 3D model showing how electricity got from an energy source to homes and how we could conserve energy in our homes (minimum of five ways). Ms. Wave distributed a written copy of these instructions individually to each student. When completed, Ms. Wade expected groups to present to each other. Each group was given a different province so that they had to choose an energy source appropriate to that location. By the end of this lesson, all groups neared completion of their constructed 3D model.

On the second class day, given a number of absences during the previous lesson, Ms. Wade provided a brief review for the students who had missed it. Ms. Wade then had students write a brief paragraph describing: (a) how electricity got to their home, (b) how they could conserve energy in the home, and (c) why they chose the source they did. Students completed this independently. Ms. Wade then gave students a few minutes to
practice the presentation of their 3D model. Following this, groups took turns presenting their models to the rest of the class. For each presentation, students and Ms. Wade paid close attention. For each group, Ms. Wade had a number of very specific questions to ask after each presentation (e.g., please describe on-demand water heating, why do we have a meter on our house, what are the pros of using tidal power, what are the cons with using a dam…how does that relate to or affect Aboriginal peoples in those areas, what does a transformer do?). Students then returned to their desks to rewrite their individual paragraphs. Ms. Wade hoped to compare the two paragraphs and identify knowledge that may have been picked up from the presentations. A review of the paragraphs showed that any question Ms. Wade had specifically asked made it into the new paragraph.

On the third and final day of the activity, using whole class discussion, Ms. Wade provided a brief review prior to administering a final test on electricity and energy. While there were numerous questions and good discussions, Ms. Wade did not discuss conservation strategies as part of the review. Students then wrote the test on the same day.

Table 3 provides a summary of the five activities that took place during this energy unit. It provides, at a glance, a list of objectives, types of activities, amount of time, and level of on-task behaviour for each of the five described activities. The average on-task behaviour was calculated based on the behaviour of the seven pre-selected students (completing a count per student every 5mins). I present this data now to provide an overview description of the energy unit. Having completed my overview of the five activities in this energy unit, I now focus on describing the post-unit interviews.
<table>
<thead>
<tr>
<th>Activity</th>
<th>Average on-task behaviour</th>
<th>Time (% of overall unit)</th>
<th>Activity types</th>
<th>Objectives addressed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy sources</td>
<td>74%</td>
<td>12%</td>
<td>➢ Whole class discussion ➢ Independent seat work</td>
<td>G1: types of energy sources and how they are classified</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>G2: Pros and cons of energy sources</td>
</tr>
<tr>
<td>Path of electricity</td>
<td>86%</td>
<td>33%</td>
<td>➢ PowerPoint presentation ➢ Building walk-about</td>
<td>S1: Path of electricity to our homes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>➢ Group work with materials ➢ Group presentations</td>
<td>S2: Knowledge of electrical circuits</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>➢ Independent seat work</td>
<td></td>
</tr>
<tr>
<td>Energy in Canada</td>
<td>80%</td>
<td>11%</td>
<td>➢ Whole class discussion ➢ Independent seat work</td>
<td>G3: Locating energy sources in Canada</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>➢ Paper-pencil test</td>
<td></td>
</tr>
<tr>
<td>Energy conservation</td>
<td>88%</td>
<td>26%</td>
<td>➢ Whole class discussion ➢ Group work with materials</td>
<td>S3: Energy conservation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>➢ Independent seat work ➢ Whole class demonstration</td>
<td></td>
</tr>
<tr>
<td>Building our model home</td>
<td>87%</td>
<td>18%</td>
<td>➢ Group work with materials ➢ Group presentations</td>
<td>S1: Path of electricity to our homes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>➢ Whole class discussion ➢ Paper-pencil test</td>
<td>S3: Energy conservation</td>
</tr>
</tbody>
</table>
After the Unit

As the energy unit came to completion, I completed two teacher interviews and post-unit interviews with each of my seven pre-selected students. One of the final teacher interviews took place when the geography classes finished, but science classes were still left to be completed (FGI). The final science teacher interview took place after all unit activities had concluded (FSI). Both teachers were present for both interviews. These interviews asked both teachers to reflect on their integrated unit, identifying successes, challenges, and perspectives regarding the next time they taught these curriculum outcomes. I also asked Mr. Norris and Ms. Wade to comment on their assessment of each of the pre-selected students I followed throughout the unit.

The post-unit interviews I completed with each of the pre-selected students averaged 40min in length. I asked students to discuss their perceptions of the unit, providing comments for each of the five activities described above. I then asked students to answer numerous questions to test their knowledge of each of the six unit outcomes. A detailed analysis of teacher and student responses will be discussed in chapters 5 (teachers) and 6 (students).

Reviewing Chapter Four

Chapter four contained a comprehensive description of all activities completed before, during, and after this integrated energy unit. The pre-unit contained interviews with both teachers and seven pre-selected students prior to the start of the energy unit. During this initial teacher interview, both teachers shared their subject specific curriculum outcomes (six in total) for their energy unit. The energy unit, when implemented, contained five activities which I described in my section titled, during the
These five activities (energy sources, path to electricity, energy locations in Canada, energy conservation, and building a model home) included a variety of opportunities for students to work hands-on with materials, independently, in small groups, and as a whole class. After the completion of the unit, I conducted interviews with the teachers and pre-selected students to discuss their perspectives with regards to the integrated unit, as well as assess each student’s ability to accurately answer questions related to the unit’s academic outcomes.

In the next two chapters I provide a thematic analysis of the data gathered before, during, and after this energy unit. Chapter five focuses on the perspectives of the two teachers involved while chapter six focuses on the perspectives and academic performance of the seven pre-selected students. Chapter seven concludes this paper by examining how this study may advance both the theoretical and practical understandings of curriculum integration.
Chapter Five: Findings and Discussion: The Teachers

As detailed in chapters one and two, four questions guided my research.

1. What are these two teachers’ perspectives and understandings regarding curriculum integration?

2. What are the issues and challenges faced by these two teachers as they implemented an integrated unit together?

3. What are the students’ perspectives on learning in this integrated setting?

4. How do students perform academically in this integrated setting and what are the issues related to this performance?

This chapter discusses themes arising out of the first two questions, focused on data gathered from Mr. Norris and Ms. Wade. Reference will be made to teacher interviews as well as classroom observations.

Research Question #1: What are These Two Teachers’ Perspectives and Understandings regarding Curriculum Integration?

In relation to this question, two themes emerged. Both before and after the unit, Ms. Wade and Mr. Norris repeatedly discussed curriculum integration in relation to purpose rather than type. In addition, in both interviews, completed after the unit, both teachers described curriculum integration as a worthwhile endeavour. These are the two themes discussed in relation to my first research question.

Theme #1: Purpose is important to teachers

While researchers like Applebee et al. (2007), Adler and Flihan (1997), and Drake (2000) comprehensively describe different types of integration (e.g., multidisciplinary, restructured, parallel, interdisciplinary, thematic, etc.), neither Ms. Wade nor Mr. Norris referenced these types. Over the course of three interviews involving questions regarding how they defined integration, how they planned to utilize integration, and why they chose
to implement an integrated unit, neither teacher discussed the possibility that there were different types of integration. When asked to define integration. Mr. Norris replied, “this is it isn’t it” (ITI, p. 9)? He was referencing our discussion which involved a geography teacher and a science teacher working together to make links between their subject areas. For both teachers, this act equalled integration. This absence of both terminology and recognition that integrated practices vary is, in itself, note worthy.

Instead, both teachers discussed the benefits of integration; they discussed what they were hoping would happen because they were integrating their two courses. In essence, they had little to say about what they perceived integration to be, but a great deal to say about their perceived purpose of integration. Of key interest, these two teachers described very different purposes for engaging in this unit. Mr. Norris focused on the reinforcement of concepts in two different classrooms; he hoped that integration would increase students’ ability to accurately recall information. Ms. Wade focused on relating science concepts to students’ ability to solve problems outside of the classroom. I discuss these two perceptions and how these related to the practices of each teacher below.

Integration provided reinforcement of concepts. In an interview prior to the start of the unit, Mr. Norris emphasized the value of reinforcement; by providing instructions in two different classes he hoped that integration would maximize student learning.

We already reinforced that your [Ms. Wade] assignment is based on the assignment that was done in my class so I’m hoping that where the reinforcement is going to come…not in the same projects because what you’ll be marking on and what I’ll be marking on can be very different…what I want out of it, is going to be different than what you’re going to want out of it…in terms of evaluation. What I’m hoping is that between the two of them, they’re going to learn a lot more, then just me doing it. (ITI, p. 10)
This quote demonstrates that Mr. Norris was very aware of the differences between the two subjects, making special note regarding how their assessments of each were separate. However, he wanted to link the content covered in each class together to maximize student learning. According to Drake (2000), Mr. Norris’ focus on making explicit connections between subjects would be consistent with an interdisciplinary view of integration. However, his focus was on what students would get out of the experience rather than defining it. Congruent with this focus, Mr. Norris’ planned assessment activities remained completely separate from any science subject matter.

What we were thinking about for this one is doing a series of, it would have to be broken down but eventually the evaluation will be based on showing which provinces have which, what to offer in terms of energy production, whether its oil, wind productions, things like that, but it would have to be broken down fairly clearly initially as a written assignment and then as a mapping assignment using symbols and things like that, so it should be pretty effective I think based on what we’ve seen in the past, sorry to interrupt you…well there’s a series of questions that we do throughout the unit anyways, so the mapping assessment would be part way through, so that would be a key one, so that would be about half way through and then there will be a final quiz or test at the end of the unit as well, the mapping assessment will com half way though, and the series of questions that we’ll be working on through…Yeah so the assessment will basically be questions as we work through each source, they’ll be doing the questions and we’ll have a discussion, take up the questions, and then map and then the final test as a final evaluation. (ITI, p. 7)

Throughout the implementation of the unit, Mr. Norris’ teaching practices were congruent with the purpose of integration he described in the initial teacher interview. Consistent with his focus on providing repeated exposure to concepts to increase student recall, Mr. Norris made explicit references to science concepts during his geography classes. He often couched these references by stating that *Ms. Wade will be talking more about this in science.* For example, in geography class, Mr. Norris discussed the challenges related to a gradual loss of energy when that energy needed to be transported
over a distance (e.g., acquiring electricity from Uranium City, lesson 1). The farther energy had to travel, the more leakage (or energy loss) occurred. He then identified that Ms. Wade would be discussing this problem later. In addition, a great deal of time was spent discussing turbines. For all three traditional energy sources, Mr. Norris described how a turbine was used to transform the energy resource into electricity (e.g., steam from heating coal turns a turbine to produce electricity, lesson 1). Even though this was not considered part of the geography curriculum, Mr. Norris’ explanations sparked numerous questions and examples from students enabling students to better understand the benefits and challenges of each energy source. As Mr. Norris discussed each of these energy sources, he identified that Ms. Wade would be teaching about how turbines actually worked.

In the final interviews, when I asked Mr. Norris to comment on his understanding of curriculum integration, he again focused on the reinforcement of concepts.

We reinforce whatever the other person is talking about and there's total reinforcement from the get go and they're talking about that--and I would say there's also an acknowledgment that there are areas that I'm not going to go into...because often I say, look I don't know how this works, ask Ms. Wade, you know I'm not quite sure about how the uranium reactor works, but this is what the intention is, and then look it's for that. (FGI, p. 11)

For Mr. Norris, discussion regarding integration was not focused on different types or conceptions of integration; integration was just the linking of subject areas. Instead, Mr. Norris focused on his reason for integrating subjects together—the opportunity to reinforce concepts in different classes. He commented that, “we really want to reinforce, if we can somehow reinforce what they are learning in one course in another with the possibility of them learning, it’s for our benefit” (FSI, p. 1). In interviews before and after the unit, Mr. Norris focused on the value of repeating content, his perceived purpose for
integration. This purpose was then demonstrated in his teaching practice through his consistent reference to science concepts in his geography classes. In contrast, Ms. Wade discussed a very different purpose for using curriculum integration.

*Integration helped students solve life problems.* In contrast to Mr. Norris’ focus on integration as a method for reinforcing student learning of concepts (repetition of content in more than one class), Ms. Wade discussed integration as a method for connecting what students learned in school to the decisions that they made outside of school. She focused on helping students apply what they learned to life problems. She gave the following example of what she meant by application and decisions outside of school in our initial interview.

They would see a windmill and they go down to make their bagel the next morning...they could make the association that the electricity is coming from the windmills outside. Rather than just thinking about windmills in terms of geography, and electricity as just electrons running through a wire, which is how they would normally think of it...I want them to be able to visually see the whole package. (ITI, p. 10)

This excerpt demonstrates two things in comparison with Mr. Norris. First, consistent with Mr. Norris, Ms. Wade focused on her purpose for using integration rather than on a description, or type, of integration. Second, in contrast to Mr. Norris’ focus on making clear distinctions between the two subject areas, Ms. Wade focused on removing those distinctions.

I think if kids can see that if things are related within their other courses its easier for them to pay attention, easier for them to see the relevance of what their learning, rather than simple little packets of information, here’s your science info, your geography and your math, well they’re all connected and if we can show them that connection, I think it would be a lot better for them. (Wade, ITI, p. 8)
Instead of separating science and geography, she wanted students to be able to see the whole package. As such, even though she did not define her view of integration using a typology, according to Drake (2000), Ms. Wade’s focus on fusing subject areas together would represent a transdisciplinary view of curriculum integration.

When Ms. Wade described her final project, her focus on having students use what they learned to make life decisions was present.

You have a house, you have to renovate a house, your house has to be located somewhere in Canada, anywhere in Canada, they won’t all be in Ontario, like some of them will be located in BC, the Prairies, they have to figure out what kind of energy are available, of the two types they have to decide what type their house can make use of, pros and cons, they’ll do a lot of that in the other classes...make use of his information, using why those areas are good for that and then....they’ll be looking at the house itself what kind of it bulbs they currently have and give them a scenario, like how many rooms the house has, what types of bulbs what kind of appliances, then I’ll give them a bunch of other appliances, bulbs with energy efficiency rate and they’ll have to choose what they’ll put in the various rooms and key objectives, I suppose... (ITI, p. 6)

Ms. Wade’s final house project was also consistent with her view that there was no point in drawing distinctions between the subject areas. For example, in the aforementioned description Ms. Wade incorporated both geography (i.e., locations of energy sources, pros and cons of energy sources) and science (i.e., path for electricity, energy conservation) outcomes without referring to specific subject areas. Instead, the outcomes were part of the whole package.

My observations of Ms. Wade teaching her portion of the energy unit revealed a range of integration. Her first two activities (path of electricity and energy conservation) involved no use or mention of geography content. There were no references made to geography as a subject area or inclusion of geography knowledge or skills. In contrast, for Ms. Wade’s third activity (building a model home), she required students to draw on
their knowledge of both geography and science; however, at no time did Ms. Wade reference the subject area of geography. She required students to use their geography knowledge with no distinction being made between geography and science. As she commented in our first final interview:

Can you all of a sudden say geography stops and science ends? You can’t, or science ends and geography starts? It's a continuum of information and you can't really know one without knowing the other… all of these little things are important because you will at some point in your life bring them all together. (FGI, p. 14)

This quote is consistent with Ms. Wade’s practice of not making distinctions between the subject areas. In the final science interview, Ms. Wade expanded on this point further, identifying how it was the application of knowledge, regardless of subject area, that mattered.

I think it’s important in life, for basically just living, making connections and being able to transfer what they are learning here…in this school environment, to their life environment, outside of school and sometimes kids do leave what they learn at school and don't apply it to their lives. (FSI, p. 1)

However, in the final interviews, Ms. Wade also commented on her lack of reference, at any time, to content covered in geography; while her final home project at the end of the unit may have incorporated geography content, she did not reference geography content throughout her unit. She expressed regret regarding this lack of reference; Mr. Norris had made a consistent effort to reference science content in his geography class while she had not returned this focus. She commented that she would, “introduce that differently… I should’ve introduced, in geography you’ve been learning about energy sources, and I should have tweaked that so there were brain [connections]” (FSI, p. 5). I found her regret interesting. Her regret emerged from a comparison between Mr. Norris’ diligence in mentioning science as a subject area and her lack of mention in
return. However, Ms. Wade’s implemented practice was consistent with her explanation regarding why she felt curriculum integration was important. This is a thought-provoking predicament.

*Linking theme #1 to research literature.* Mr. Norris and Ms. Wade both defined integration as the mixing of subject areas. However, their reasons for teaching an integrated unit were different—and it was these different reasons for integration that were ultimately consistent with their implemented practice. Even though they defined integration the same, their teaching practices related to their two very different purposes for integration. Adler and Flihan (1997) note that defining integration as a mixing of subjects is common, but that actual implementation of integration is quite varied. While Ms. Wade and Mr. Norris verbally defined integration similarly as a mixing of subjects, I would argue that Ms. Wade’s conception of curriculum integration was quite different from the definition they provided.

Similar to Drake (2000) and Venville et al (2000), Ms. Wade advocated that the connections students can make between subject areas were ultimately more of a concern than subject specific knowledge. She wanted students to be able to use their knowledge of how geography and science (in this case) were bridged to help them make critical decisions regarding future choices. Similar to Meier et al (1998), Ms. Wade’s focus was on being able to solve important, relevant problems. Ms. Wade’s final project, eliminating boundaries between these two subjects and emphasizing student-relevant concerns and decision-making would align with Beane’s (1995, 1997, 2005) view of curriculum integration as a form of democratic pedagogy. While Ms. Wade never used any of these terms, her teaching practices demonstrate a strong alignment with
proponents of a restructured curriculum. Consequently, in contrast to her definition which focused on curriculum integration as a method or approach to instruction, her discussions regarding purpose as well as her actual teaching practices illustrate a conception of integration as curriculum; the integrated learning was the end result, not the method of getting there.

In contrast, Mr. Norris’ intense focus on maintaining clear boundaries between science and geography illustrates a view of integration that is consistent with the definition he provided. The actual mixing of subject areas, his explicit references to science concepts, aligns with a perception of integration as a method of instruction. Mr. Norris implemented curriculum integration as an approach to improve student retention and recall of knowledge.

In the few studies that do discuss teachers’ perceptions of integration (as opposed to an article author’s definition of integration), research reveals a consistent focus on purpose (Bintz et al., 2006; Czerniak, 2004; Diem, 1996; Hargreaves et al., 2001), similar to the two teachers in this study. However, interviews with Mr. Norris and Ms. Wade revealed a challenge for Ms. Wade.

Ms. Wade expressed regret over a lack of congruence in practice that she had not considered prior to the start of the unit. These teachers defined integration similarly and perhaps assumed their practices would be similar as well; however, their different reasons for implementing this unit affected their practice more than their definition of integration. Consequently, one important outcome from this study is the recognition that: (a) while teachers may define integration broadly, they focus primarily on their reasons for using integration; (b) their reasons for using integration can have a substantial influence on
their practice; and, (c) when more than one teacher is working on an integrated unit, it is important for these teachers to discuss how their reasons for implementing integration may influence their practice. As I discuss later in this chapter when I examine the challenges faced by these two teachers, it would be valuable for this discussion regarding purpose and practice to continue throughout the implementation of the unit.

While Mr. Norris and Ms. Wade may have had different reasons for implementing an integrated unit and different practices as a result, they were congruent in their perception of the value of curriculum integration. Both teachers felt the unit was worthwhile and valuable for students; both teachers were going to use curriculum integration again.

Having discussed my first theme, recognizing that purpose was important when implementing curriculum integration, as well as links to research literature, I now turn to my second theme in relation to teacher perspectives regarding curriculum integration.

Theme #2: Teachers felt curriculum integration was worthwhile

In our interviews, both Mr. Norris and Ms. Wade shared that they felt curriculum integration was a valuable teaching method. Consistent with their differing views of integration, when asked to discuss whether they felt integration was valuable, each teacher cited different evidence when measuring the value of the unit (e.g., improvement on tests versus making informed decisions); however, both teachers also discussed the value of using curriculum integration specifically for their Applied students. Below, I discuss measuring the value of the unit and the benefits for students in an Applied stream.

Teachers use different measures to report on the value of curriculum integration.

Mr. Norris’ teaching practices focused on providing reinforcement of concepts in more
than one classroom so that students would take more in. It is not surprising that he then focused on students’ ability to demonstrate learning of these concepts using a test as a measure of whether students had learned the three geography objectives for the energy unit. In his final interviews, Mr. Norris commented that students were more successful on the final quiz he gave for the energy unit in comparison to other geography quizzes this same group of students had written this year.

When asked to reflect on this further, Mr. Norris was unsure which played a greater role in these higher test marks: the reinforcement from using an integrated unit or having students completing the review and the quiz on the same day. This was the first time that Mr. Norris had scheduled the review and test on the same day. However, to balance this concern, I interviewed and tested seven of Mr. Norris’ students more than two weeks later on the same material. My interview results were consistent with Mr. Norris’ test results: the knowledge students demonstrated on Mr. Norris’ final quiz was successfully demonstrated when I retested them weeks later. After learning this, Mr. Norris felt that he would continue with this new method of preparing students for a test or quiz along with his continued use of curriculum integration.

I’m glad you guys came in because it really forced us to really actually give this a go, and I think the second--the next time that we have a chance to do it, it’s going to go a lot more smoothly and I would like to try--and it would be great if we could do it more often with other fields like mathematics. (FGI, p. 16)

Consequently, not only did Mr. Norris want to repeat this integrated energy unit, he wanted to expand his use of curriculum integration to include more subject areas.

Similar to Mr. Norris, Ms. Wade was enthusiastic about curriculum integration in our final interviews; she felt it was very beneficial for students. However, what she cited
as evidence for this success was very different than Mr. Norris. Ms. Wade was excited about how students were discussing how they would use what they learned in future decisions. She commented that, “I think we are making environmentalists” (FSI, p. 3).

She elaborated:

There are still a few weaknesses. They don't have everything but they have a lot more than when they began. Like before, like you said, it was just switching things off, but now a lot of them will say when I hang your clothes to dry—they seem to remember that one. Don't open your windows and doors in the winter time, unplug things that use a tiny bit of power like TVs and have lights on, use the LED lights. (FSI, p. 3)

Beyond having students aware of how they could conserve energy, Ms. Wade was excited that students had realized that they had a choice; their actions meant something.

Because they loved the bull frog thing [a company in Ontario that enables homeowners to choose the type of energy source that provides their home with electricity], where you, they liked that idea. They liked the idea of changing light-bulbs. I think they liked the idea that they actually do have some control and some choice over their electrical consumption and they have the ability to either you know reduce it or not. So they chose to a lot they are going to use a lot and that's why I kept going back to the meter. There is a meter on your house, what does it do? It's going to measure how much you're using and you're going to have to pay for that, and that's, it's good to reduce for environmental reasons but you're also saving yourself money. (FSI, p. 6)

She elaborated further on how important it was for students to think critically about the decisions that they make:

And I think making, teaching kids to realize that they're responsible for the choices they make. If you are going to chose to drive a humvee and you're going to end up paying, there are consequences to that: (1) huge gas bills, (2) don't go complaining about global warming…don't go complaining about the fact that food prices are going to rise because crops are failing in other parts of the world because you are choosing to drive a humvee. And that decision alone affects many other things and I think empowering them and making them realize that they have the ability to make decisions and the responsibility to make wise decisions. (FSI, p. 6)
Given the apparent influence this unit had on students’ decision-making abilities, Ms. Wade was adamant that she would include this unit in her class next year; however, Ms. Wade also planned to try and increase the number of explicit connections that she made to the energy sources content in the geography class. She shared that she felt this would be useful because of the benefits she observed in her own class; students were able to take the science concepts discussed in geography class and apply them in science class.

Ms. Wade shared a specific example from the model home activity:

I think we did, I mean because one of the project they did in groups they had to use materials that they had in the room, power from generation, from source to where you use it in your house and...then I said, ok, you're in Ontario, you're in BC, you're in Sask., you're in Nova Scotia and so Nova Scotia picked tidal, Sask. picked wind, BC would've probably picked hydro, and they were able to justify it based on location so.....you know so, and they were also talking about things turning when they did the dam, when they did the wave energy, or the tidal, they actually created a little generator, they said ok, the water is going to come up here, it's going to go down this little hill, this little hole, as it goes down this little hole the blades are going to turn they are going to spin and generate electricity, so they were able to do that and they learned that in your [Mr. Norris’] class not in my class. (FSI, p. 4)

Consequently, Ms. Wade recognized a benefit from referencing subject matter content in more than one classroom in addition to affecting student decision-making.

As well as the benefits in relation to knowledge of curriculum outcomes and students’ ability to apply knowledge when making decisions in the future, both teachers recognized a specific benefit for using curriculum integration with their Applied students.

*Curriculum integration has specific benefits for students in an Applied stream.* In their final interviews, both teachers commented on how important they felt it was to implement an integrated unit specifically with the students in the Applied stream. Mr. Norris shared that:
I think that they're--you already hear discussions when they're talking about stuff. A prime example is one of the questions was about solar power and why solar power isn't very popular is it true or false, and a lot of them got that right [on students’ final written geography quiz], and to me indicating that they now have a full knowledge of why solar energy isn't one of the better sources in Canada, or indeed there are obstacles to putting it up in Canada. So the whole issue of oil and things like that will be thought about in future. But you know the interesting thing about the Applied is, in a lot of respects, they are more aware socially and worldly aware than most of the academics, they got some street sense about them that I think they're just more aware of what's happening outside… (FGI, p. 12)

In support of Mr. Norris’ comment, Ms. Wade shared that:

I think, Applieds have difficulty relating concepts from like let's say one subject to another. It's almost like they are compartmentalized, like I learn math here and I do math there. I learn science here and science here, they don't realize, it takes a lot for them to realize that there are connections amongst everything. (FSI, p. 1)

Ms. Wade elaborated to compare her Applied and Academic students:

I find that they [Academics] already take the concepts from, like when I do electricity I'm already hearing stuff that they are doing in geography, they already have to make models and have to use certain things and they're already transferring those concepts. (FSI, p. 2)

Consequently, the importance of establishing connections between classroom activities and the daily lives of their Applied students was discussed a great deal by both teachers in their final interviews. However, the purpose of these connections remained consistent with each teacher’s perceived purpose for integration. Mr. Norris focused on making connections to increase student learning of curriculum outcomes (e.g., demonstrating they actually know the benefits and challenges of solar power) while Ms. Wade focused on making connections to reinforce decisions outside of the classroom.

*Linking theme #2 to research literature.* In many ways, my results fit with current research literature. Both Ms. Wade and Mr. Norris were very positive about using curriculum integration; this is consistent with numerous other studies (e.g., Adler &
Flihan, 1997; Bintz et al., 2006; Czerniak, 2004; Diem, 1996; Hargreaves et al., 2001; Johnston, 2005; Ross & Hogaboam-Gray, 1998; etc.). Also consistent with these examples, when sharing why they were positive about curriculum integration, Mr. Norris and Ms. Wade referenced evidence consistent with the purpose they focussed on for their unit. For example, Diem’s (1996) teachers wanted to increase parental involvement and this was discussed by the teachers involved as the reason they felt the unit was successful.

In my study, Mr. Norris and Ms. Wade focused on students’ ability to recall information accurately and using knowledge to make life decisions, respectively, to support their opinion that curriculum integration was a valuable teacher practice. Interestingly, these two foci are represented disproportionately in current research literature.

Ms. Wade’s focus on valuing students’ use of knowledge for decision making outside of the classroom is consistent with a great deal of research reporting on the value of curriculum integration for increasing student motivation, engagement, and perceptions of relevance (e.g., Berlin & Hillen, 1994; Bintz et al., 2006; Flowers et al., 2003). Research demonstrates that teachers focussed on motivation and engagement report curriculum integration as valuable, and Ms. Wade’s comments add to this body of literature.

In contrast, far fewer studies report on the value of curriculum integration for improving students’ academic learning (e.g., being able to recall knowledge of curriculum outcomes accurately). In some cases (e.g., Ross & Hogaboam-Gray, 1998), while positive results were identified for student motivation and engagement in comparison to non-integrated units, similar results did not exist for student academic learning. As noted by Grossman et al (2000), “despite the popularity of interdisciplinary
curricula across the nation, there is no body of evidence that attests to greater learning in high quality interdisciplinary versus high-quality disciplinary classrooms” (p. 9). In very few research studies (e.g., Nuthull, 1999), positive results were reported for academic learning. However, similar with Mr. Norris in my study, the purpose identified by teachers at the onset of the study was improved student academic learning. Consequently, my discussions with Mr. Norris support and extend the caution made by Ross and Hogaoam-Gray (1998); they advise teachers to understand the relationship between the types of integration used in relation to whether improvements in student academic learning are achieved. I would extend this caution. Given the focus both of my teachers had on their reasons for implementing an integrated unit and how that related to the teaching practices they utilized, I would caution that teachers need to understand the relationship between the purpose behind why they are integrating and how that may affect the practices they use during their integrated unit as these may strongly influence results regarding student academic learning.

To extend this discussion further, as noted in chapter two, Applebee et al. (2007) examined types of integration and how those integrated units were implemented. They found that the majority of integrated units, when implemented, involved a high level of student collaborative activity and student-directed questions—and the more integrated the disciplines (e.g., transdisciplinary integration), the more collaborative the teaching practices were for that unit. However, they noted that the implementation of these collaborative practices were teacher dependent; individual teachers may have highly collaborative activities (similar to Ms. Wade) or have little collaborative activities (similar to Mr. Norris) regardless of the type of integration they were utilizing. Missing
from this discussion was mention of purpose in relation to practice. Perhaps, variation in teacher practice can be explained in terms of purpose for choosing curriculum integration? Perhaps, variation in improved academic student learning could also be explained by examining purpose. I would argue that discussions with regards to the purpose teachers are implementing curriculum integration, the practices they feel will meet that purpose, and reports on student learning and teacher assessments of their unit are needed for future studies examining curriculum integration.

Reflecting back on this study, during my initial interviews with both teachers, after listening to the different reasons they had for implementing an integrated unit, I could have begun a discussion about the different types of integration. Both teachers thought of integration as a singularity, just the mixing of subject areas. By introducing the different types or conceptions of integration, an interesting discussion could have emerged. Ms. Wade’s focus on empowering students to make informed decisions regarding energy use strongly aligned with the democratic pedagogy encouraged by Beane (1995, 1997, 2005). A number of the lessons she taught were designed to inform students of the choices that were available to them and the implications of those choices. However, a number of Ms. Wade’s lessons also focused on specific curriculum content (e.g., series and parallel circuits) and were unconnected to her personal goal of developing active and informed citizens.

Would a discussion of the different types of integration have led Ms. Wade to reorganize her activities, perhaps implementing a restructured curriculum around student questions and concerns regarding energy use rather than curriculum bound content? How would she have aligned her activities with Mr. Norris’ focus on repetition and
reinforcement? Would her evaluation of student academic performance remained the same or perhaps become more complicated? Another challenge: would the initiation of this discussion comprise my study? I believe that this discussion would have changed the results of my study, making it a different study altogether. However, I believe that Ms. Wade would have been excited to engage in this discussion and she would have been able to be more purposeful in her implementation of curriculum integration. Regardless, a consideration of purpose and teacher practice remains an important consideration for researchers and teachers alike.

In addition to this focus on purpose in relation to practice and student learning, the results from this study also indicate that additional research examining how curriculum integration may influence learning for those students specifically in Applied courses, designated at-risk, or experiencing academic difficulty. Research to determine effective teaching practices for helping students who consistently experience a lack of success with academic learning emphasize the importance of linking academic knowledge to experiences outside of school, integrating knowledge to provide continual review and reinforcement, and balancing direct instruction with higher-order thinking activities (Allington & McGill-Franzen, 1989; Campbell & Chastain-Bogy, 1996; Johnson, 1998). This emphasis on making links is echoed in the focus Ms. Wade and Mr. Norris made regarding connections. The aforementioned effective teaching practices were incorporated by Ms. Wade and Mr. Norris and are similar to practices described in much of the aforementioned literature on curriculum integration. However, specific studies examining curriculum integration with at-risk students is minimal. This is an area in need of further exploration.
First question summary

In review, Mr. Norris wanted to improve student recall of academic knowledge and believed that integration would provide enough repetition and reinforcement of similar concepts to increase students’ recall. When examining student responses on academic tests and interviews, Mr. Norris identified a greater level of success for his students for the curriculum outcomes of this integrated unit in comparison to other non-integrated units completed earlier in the year. Ms. Wade wanted students to be able to make informed decisions in their lives outside of the classroom and believed that integration would demonstrate the whole picture for students. She implemented activities that involved many discussions, incorporating hands on activities and accessing prior knowledge. She also implemented a final assessment activity that incorporated both science and geography objectives without making any distinctions—a final model home project that had students make decisions and demonstrate knowledge from different subjects working in unison. When reflecting back on this project and student discussions, Ms. Wade was excited about how students felt empowered to make decisions in their future with regards to energy conservation.

In relation to my first question (What are these two teachers’ perspectives and understandings regarding curriculum integration), an analysis of my data and comparisons with current research literature has led to several interesting discussions. Both teachers found curriculum integration extremely valuable for their students, noting specifically an increased value for their particular group of Applied students. This valuing of integration is especially interesting given the different reasons, practices, and assessments executed by each teacher. Whether implementing integration as
reinforcement or to help students make informed decisions, both teachers were excited to continue using integration. Of all the discussions, the one common thread through all of them is the central idea of purpose.

Why do teachers implement curriculum integration in their classrooms? In my study, there were different reasons which were then consistent with different teaching practices and different reasons for valuing curriculum integration. In contrast, there is a consistent lack of reporting in the field with regards to the reasons teachers implement an integrated unit with an even greater paucity of research linking any teacher identified purpose to actual teaching practice. It is possible that this missing discussion regarding teacher purpose and practice may provide valuable insight into the inconsistencies demonstrated in the research literature for curriculum integration. It may provide information regarding individual teacher differences in levels of student collaboration independent of the type of curriculum integration being implemented (e.g., Applebee et al., 2007). It may also provide information regarding the inconsistent reporting of improved student academic success (e.g., Nuthall, 1999 vs. Ross & Hogaoam-Gray, 1998; Venville et al., 2003).

Consequently, based on results from this study, I would argue that discussing purpose in relation to practice is a critical aspect to any future study of curriculum integration, especially in relation to defining different types of integration and student academic performance. I will focus more on student performance in relation to this study in chapter six when I analyze information related to the students in this grade nine Applied class. Now, I turn my focus to my second research question in relation to these two Beachville teachers.
Research Question #2: What are the Issues and Challenges Faced by these two Teachers as they Implemented an Integrated Unit Together?

As discussed in chapter one, research identifying the challenges faced by teachers trying to implement an integrated unit are abundant. These challenges range from difficulties scheduling in course time and increased planning time (Bintz et al., 2006; Diem, 1999; lowers et al., 2003; Wallace et al., 2001), to trying to assess discipline specific outcomes, and a lack of disciplinary specific knowledge on the behalf of the teachers (Ross & Hogaboam-Gray, 1998; Meier et al., 1998; Venville et al., 2003). Interestingly, Ms. Wade and Mr. Norris only discussed two challenges in relation to this integrated unit: scheduling and common planning time.

These concerns are very practical in nature; at no time did Ms. Wade or Mr. Norris express concern regarding their assessment of discipline specific outcomes, or their own expert knowledge. This may be due to the fact that while these two teachers were working together to schedule their units simultaneously, they kept their disciplines separated. At no time was one teacher responsible for teaching two subjects. While Mr. Norris referred to content Ms. Wade would be teaching, he did not attempt to teach science content. While Ms. Wade’s final model home project involved geography content, she did not teach that content. Instead, she had students reference it during their projects. For their assessments of student knowledge, each teacher implemented separate tests focused solely on his/her discipline. While Ms. Wade’s model home project involved content from geography, she only took the information in relation to science to calculate student marks.
Ms. Wade and Mr. Norris’ complete separation of content is indicative of the curriculum in Canadian high schools. As the review of Canadian curriculum documents in chapter two illustrated, while integration is supported as a practice, the curriculum is not integrated. Instead, curriculum outcomes remain in separate, subject specific courses. When high school teachers report on their own subject area, there is no report card room for comments regarding other subjects. Consequently, neither Ms. Wade nor Mr. Norris found it problematic to keep their subjects separated even while implementing an integrated unit.

I found it interesting that Ms. Wade did not question this lack of separation between subject areas. While Mr. Norris’ view of curriculum integration was based on clear boundaries between subject areas, Ms. Wade’s view of curriculum integration emphasized the dissolution of boundaries between subject areas. Consequently, her evaluation of student academic performance and her complete separation from teaching geography content are at odds with the purpose she focuses on for implementing curriculum integration. Yet, she did not consider this a dilemma. In many respects I view this as a result of a strong, Canadian commitment to clear subject specific boundaries—the culture of Canadian high schools is based on separate subject areas and Ms. Wade did not question it. While I consider this issue of regarding the separation of content further in chapter seven, I now focus on the concerns Ms. Wade and Mr. Norris did discuss: scheduling and common planning times. These represent my two themes in relation to my second question.
Theme #3: Common planning time is important

During my initial interview with Ms. Wade and Mr. Norris, I asked them why they chose to implement an integrated unit. In her response, Ms. Wade identified that this was not the first time she wanted to integrate different subject areas; this was just the first time she was able to make it happen.

Yeah, Marcy is a another teacher….she was teaching the Applied geography and I had the Applied’s for science, and we got together to see what we had in common and where we were doing things. It never got past the first discussion, and when I saw [your request], I thought this was an opportunity to, actually force myself into making it happen...I wouldn’t do it otherwise actually, because it is more difficult. It requires more meetings, it requires sitting down, and this time of year it gets hard, it gets crazy. (ITI, p. 8)

Even prior to starting an integrated unit, Ms. Wade was concerned with the time it would take to connect with another teacher. This apprehension proved a reality during this integrated energy unit.

After their integrated unit had started, Mr. Norris and Ms. Wade experienced challenges with regards to time—a lack of common planning time. In the initial interview, Ms. Wade forecasted that this may be a problem:

I mean planning, proper planning of it…its hard to do on the fly, over the year, with sports that are running and this and that. I mean, we’re all involved in so much outside of school; it’s hard to figure out a schedule when we can all actually meet. (ITI, p. 12)

As such, Ms. Wade really appreciated the opportunity to work with me as a way of ensuring that the unit actually came to fruition.

However, in their post-unit interviews, both teachers commented more on the additional problems they experienced trying to identify common planning time together as the unit progressed. Mr. Norris and Ms. Wade worked in a large school, on different
floors, with different break times, and heavy course loads. They found it extremely difficult to meet together regularly. While they had planned to meet briefly each week to touch base, they were never successful with this. Both teachers met with me before the start of the unit and twice for their final interviews. Other than these three interviews, Mr. Norris and Ms. Wade had been unable to meet. Instead, I worked as a type of go-between. As I visited each class, I commented on the content being covered in the other classroom. This provided the opportunity for some communication between both teachers that would not have otherwise been possible. As Mr. Norris commented:

Because we should be always working together in terms you know--and there's two problems, one is that the school's big and the time tables are crazy and we have all these other obligations, you can see I've got all this other stuff happening, but it's also the courses, as they're required in their set up and when we have to teach them, you know this was just luck that we managed to hit these ones. (FGI, p. 8)

Communication throughout the unit was a skill that both teachers felt they would focus on improving in the future. As Mr. Norris noted, “I think the biggest weakness, and it's simply because there aren’t times, is that we didn't talk enough. We should have been talking all the time” (FGI, p. 7). Echoing this comment, Ms. Wade shared an example of how valuable it was to have content being covered in coordination:

Because when I did say to [students], well, what do we call those lines, and they said, oh hydro or power lines. I'm like okay well, where do you get power from? And then they're all spewing out alternative, and wind power, and nuclear--like they spit out all of the stuff they learned here. (FGI, p. 9)

As a result, collaboratively planning together to ensure this overlap of content during the unit was important for both teachers.

Linking theme #3 to research literature. As noted in chapter two, Hargreaves et al (2001) discussed the challenges of common planning time in secondary schools, referring
to secondary schools as having a strong subject focus. Wallace et al. (2007) reported the same challenges. Drake (2000) supported these reports by comparing elementary and secondary schools, noting that secondary school teachers teach disciplines as opposed to students. Similarly, Flowers et al. (2003) recommend meeting four times a week for 30min of common planning time. In this case study, this lack of common planning time was a serious concern for both teachers. They noted that this lack of time throughout the implementation of the unit resulted in a decrease in their ability to reinforce concepts in the two different classrooms. The challenges discussed by Mr. Norris and Ms. Wade are consistent with these comments. For Beachville, subjects were scheduled throughout the year with little to no focus on cross-curricular planning opportunities. It was left to the two teachers involved to note a possible opportunity to integrate courses together, initiate that communication, and find time to plan/alter course outlines. Research examining curriculum integration consistently notes scheduling, especially at the secondary level, challenging for teachers.

**Theme #4: School scheduling can be an impediment**

In addition to finding common planning time, Mr. Norris and Ms. Wade also commented on the challenges in a secondary school with regards to scheduling. Prior to the start of the unit, actually having their courses scheduled into the same time block was difficult. As noted earlier, neither Ms. Wade nor Mr. Norris had ever taught using curriculum integration before this energy unit. Consistent with secondary classes in Ontario, each subject area is taught by a different teacher in a different classroom at a different time. Administrative personnel were usually responsible for scheduling courses throughout the year (often based on room availability). As noted by Mr. Norris, it was
rare that two teachers were scheduled subjects that could integrate well in the same term (the school year was broken into three independent terms).

It is fortunate too that we got the timetable as it stands right now. By altering our timetables slightly we can actually hit the same thing at the same time ‘cause there’s some overlap in the course. But, generally I’m teaching something at the beginning of the year that you [referring to Ms. Wade] might be teaching in January...so it’s hard. (ITI, p. 8)

Having timetable schedules determined by administrative personnel made coordinating an integrated unit difficult; however, even once the terms had been set, additional scheduling concerns existed.

Even though the two subjects were scheduled for the same term, both teachers had to alter the sequence of units for their term to ensure that they were addressing electricity and energy at the same time. Mr. Norris referred to this as ensuring that, “the courses line up” (ITI, p. 9). For this particular energy unit, it meant that Ms. Wade had to alter the sequence of her Applied classes: “Well this is why I did biology first, cause I’m actually doing electricity now with my nine academics” (ITI, p. 9). Consequently, there were challenges with both timetabling as well as lining up course content to ensure that both teachers were able to overlap the appropriate subject matter.

_Linking theme #4 to research literature._ Diem (1996) detailed a specific research study regarding curriculum integration that provided training, matching schedules, team leaders, and conference periods for the teachers involved. These administrative aspects were considered critical to the success of the unit. Burns and Sattes (1995), in their facilitator’s guide for implementing curriculum integration in schools, elaborate on the aforementioned scheduling and time provisions noting that:

> It is essential that interdisciplinary teams have noninstructional days within the school calendar devoted to developing integrated curriculum.
Furthermore, they must have regularly scheduled, shared, planning time during the school day or week. (Some teams may prefer longer blocks of time every other day or once a week rather than a shorter block of time daily.) Not only do teachers need time to plan, they need time for reflection on their work. (p. 46)

Second question summary

In answering my second research question, what are the issues and challenges faced by these two teachers as they implemented an integrated unit together, my results are consistent with current research literature. Ms. Wade and Mr. Norris were challenged by problems with time. Prior to the unit, they were challenged to find two courses that could be scheduled in the same term. Throughout the unit, they lacked collaborative planning time to discuss what was happening in each class so as to identify ways to continually reinforce the concepts being taught. For both of these needs, scheduling and common planning time, Mr. Norris and Ms. Wade needed to access support from the school administration. In this case, the first time either teacher had worked on an integrated unit, these needs were unclear and, as a result, minimal support was sought from the Beachville administration.

Only after their courses had been scheduled in the same term did Ms. Wade and Mr. Norris approach their principal regarding an integrated unit. They requested some teacher-on-call (TOC or substitute teacher) time for some common planning and meeting during the school day prior to the unit. They were granted two afternoons prior to the start of the unit. No additional requests for time were made. As a result, both teachers relied on me to provide them with updates on how the unit was progressing in each classroom. The experiences and challenges of these two teachers provide two important provisions for future research in curriculum integration.
First, it is important that the teachers involved are aware of the time and scheduling needs of curriculum integration long before they implement their unit so that they can meet with school administration to arrange appropriate scheduling (so that parallel courses can be taught in a single term), planning time prior to the start of the unit, and common planning time throughout the unit. Second, researchers working with teachers would be well advised to keep track of the assistance that is provided in keeping teachers informed of progress in each class; this can be an important factor to consider when analyzing teacher comments.

Having completed an analysis of my data in relation to the two teachers in this study and relating this analysis to my first two research questions, I now turn my attention to data pertaining to the students in this grade nine Applied class at Beachville Public School. Chapter six details my analyses in relation to the last two research questions regarding student perspectives and academic performances.
Chapter Six: Findings and Discussion: The Students

Chapter five discussed my first two research questions in relation to the Beachville teachers who participated in this study.

1. What are these two teachers’ perspectives and understandings regarding curriculum integration?
2. What are the issues and challenges faced by these two teachers as they implemented an integrated unit together?

For this chapter I now discuss my final two research questions in relation to the students in this Applied grade nine class.

3. What are the students’ perspectives on learning in this integrated setting?
4. How do students perform academically in this integrated setting and what are the issues related to this performance?

This chapter discusses themes arising out of these final two questions, focused on data gathered during classroom observations, as well as interviews with students before and after this integrated energy unit.

Research Question #3: What are the Students’ Perspectives on Learning in this Integrated Setting?

Just as my first two research questions focused on the perspectives of the teachers, this research question focuses on the perspectives of the students—their voices and opinions. There are two themes that emerged in relation to this question. Students discussed how they valued being a part of an integrated unit; they found it easier to learn with concepts being perceived as relevant to their own lives. In addition, they really enjoyed the hands-on learning opportunities that were included in the unit. I discuss these two themes in turn.
Theme #5: Students valued this integrated unit

When I interviewed the seven pre-selected students prior to the start of the unit, I asked them if they knew what curriculum integration was; one student felt he understood the concept and one student guessed at an appropriate answer. The other five students had not heard of curriculum integration and guessed it had something to do with either geography or science.

In his pre-unit interview, Peter described integration as, “stuff to be intertwined together” (Peter pre, p. 1). He felt that his teachers were doing an integrated unit because “we can learn. It is easier to learn, ‘cause you are doing the same topics kind of” (Peter pre, p. 1). Similarly, Jamie guessed integration was “maybe like putting things together, or something like that” (Jamie pre, p. 1). She felt that her teachers were working together “because geography is kind of like the same thing. They kind of have the same subjects as science, sometimes, I guess” (Jamie pre, p. 1). In contrast to these two students, the other pre-selected students had no idea about integration. Ryerson and Daniel refused to even guess at a possible definition of curriculum integration while Leah thought integration might be “like going into another country.” Krista, when repeatedly encouraged, guessed that integration had “something to do with static electricity” (Krista pre, p. 1). Similarly, Abram guessed that integration was “something where the electricity enters the building” (Abram pre, p. 1).

While they may have been unsure of curriculum integration at the beginning of the unit, by the end of the unit, the majority of students were very positive about having their two teachers work together. Below, I discuss the two main reasons for why students valued this integrated unit: ease of learning and relevance beyond the classroom.
Students felt it was easier to learn. In their final interviews, students discussed how having the two subjects integrated made it easier to learn concepts in both classes. The reasons it was made easier did vary, with some students commenting on the value of repetition and others discussing being able to see a larger picture. Ryerson shared that, “the fact that they were both talking about the same thing in two different ways…and explaining it, it seemed more convincing and…like…they both had different ways of explaining it so it made more sense” (Ryerson final, p. 4). Similarly, Leah shared that “working on the two subjects, they are kind of the same….so it’s easier to learn” (Leah final, p. 2). Abram, the only ESL students in the class had a similar comment. He shared that: “I would say it make it better because then you can look at double as much time to understand the subject and it’s electricity and it’s a bit complicated, but I figured it out I think” (Abram final, p. 1). For Ryerson, Leah, and Abram, the repeated practice and reinforcement were helpful.

In contrast, Jamie felt it was easier to learn in both classes because she was able to see a larger picture. In her final interview she repeatedly commented that geography showed her where, while science taught her how. For example, when discussing traditional energy sources, Jamie commented on how having her teachers work together was beneficial: “because like the geography kind of told you where the plants are and then the science told you like, how it gets from one place to another” (Jamie final, p. 3). Daniel provided a similar response focusing on how understanding how these two subjects related to one another made it easier to learn. He commented that:

Well, because in Geography we were learning about more of the resources and where it comes from and stuff like that, and then in Science we were learning more about how we take that resource and turn it into power and where it goes after that. So, it was like easier to understand both at once
when you got it taught in Geography and Science. (Daniel final, p. 3)

Peter also agreed with Daniel and Jamie, sharing that integration made it easier to use the two subjects together.

The one counter-example to student perceptions that learning in an integrated unit was easier was Krista. In her post-unit interview Krista was not very positive about having her two teachers work together (the only one of seven to respond negatively to this question). When asked if she felt there were any benefits, she said:

...well, at the beginning when he showed us like this is the hydro plant and--I mean yeah those different kinds of plants and power sources, like that was similar, but other than that like with their summative, it just wasn't really the same. (Krista final, p. 1)

However, this negativity was focused specifically on geography class. Krista shared that:

Well I learned a lot in [Ms. Wade’s] class 'cause [in geography class]...I didn't really learn anything in that class. But I learned a lot in [Ms. Wade’s] class about electricity and how it travels and the different kinds of, like static electricity and like hydro and stuff. It's like, I don’t know, I just learned a lot in that class. (Krista final, p. 1)

In her final interview, Krista commented on preferring the hands-on, small group work in science class compared to the whole class discussion in geography class.

[Mr. Norris] handed us a sheet and sent us off to work and I wasn't really clear what to do and then I just ended up asking other people and it took longer. But then in [Ms. Wade’s] class she explained it and we did it in partners, and we all got to do it together so it was easier and I understood it more. (Krista final, p. 2)

As demonstrated by Krista’s explanation, she was frustrated by the types of activities she experienced in geography. Her first set of comments actually demonstrate a high level of integration; she was unable to separate the science from the geography, but she was not happy with the independent seat work and whole class discussion. Consequently, she was not unhappy with participating in curriculum integration, she was unhappy with specific
types of activities. I believe this is an important clarification and I return to this below when linking theme five to research literature.

Besides discussing whether it was easier or not to learn in an integrated setting, students also commented on how they valued integration because they perceived the content as being more relevant to their own lives.

Students found their learning relevant. In addition to discussing how having the two subjects integrated made it easier to learn, students also gave examples regarding how they could use what they learned in the future. Peter noted specific situations in which what he learned could be applied to life outside the classroom. For example: “My parents are thinking of getting that [solar panels] for the pool…putting a solar panel on the house. But then we got just a regular heater instead, but they’re thinking down the road of getting one” (Peter final, p. 2). Daniel also shared that he felt that this unit helped prepare him for future real-life tasks. For example: “if we need to pay like an electrical or a hydro bill or something, you need to understand that sort of stuff so we can pay our bills and stuff” (Daniel final, p. 1). Abram commented that, “I have learned how you can save electricity and how you can make electricity…I kinda thought it was just something that was in the air. Stuff like now, it’s kind of like an element” (Abram final, p. 1).

Consequently, beyond finding it easier to learn concepts during an integrated unit, students also felt that what they learned was of value; they could use it in the future. Whether this is due to the content being covered in the unit (e.g., energy conservation), the emphasis placed on making decisions (as was a focus for Ms. Wade), or that students were better able to identify how to use knowledge that was integrated remains an interesting question worthy of further investigation.
**Linking theme #5 to research literature.** When relating this theme to existing literature, there are three discussions, building on each other, that need to occur. First, consistent with current research, the students in this study enjoyed this integrated unit. Czerniak (2004), Diem (1996), Flowers et al. (2003), and Johnston (2005) all reported that their students enjoyed participating in an integrated unit. Even more specifically, Bintz et al. (2006) used measures of on-task behaviour, while Berlin and Hillen (1994) used measures of attendance and on-task behaviour as evidence of student enjoyment. This is not surprising, for researchers or for teachers. In their reviews of articles regarding curriculum integration, Adler and Flihan (1997) and Grossman et al. (2000) report that teachers choose to use curriculum integration because students find it motivating. That is the first discussion.

For my second discussion, moving deeper, I believe it is important to ask why students did or did not enjoy this integrated unit. As noted by Drake (1998), Adler and Flihan (1997), and Applebee et al. (2007), the types of activities utilized when integrating curriculum are quite varied. While integrated units often include more student-directed activities, this trend has been found to be dependent on the teacher (Applebee et al., 2007); some teachers utilize student-directed activities while others are more traditional in their approach. Ms. Wade and Mr. Norris were two such examples of this dichotomy. While they were both implementing an integrated unit, they utilized very different types of activities. I believe this presents a significant concern for researchers. When we ask students (and teachers, I would argue) to report on whether they enjoyed the unit, is their enjoyment because the subjects were integrated or because of the types of activities they experienced within the unit? If we observed higher levels of on-task behaviour, is it
because of the specific type of activity or because this was an integrated unit? For each of the studies listed previously (Berlin & Hillen, 1994; Bintz et al., 2006; Czerniak, 2004; Diem, 1996; Flowers et al., 2003; Johnston, 2005), no discussion was included regarding why students reported enjoyment (or were observed on-task). Instead, researchers presented the conclusion that students enjoyed curriculum integration without discussing the possibility that students enjoyed the activities, whether integrated or not.

In this study, I specifically asked students to identify if they felt having their two teachers work together made it easier to learn (refer to Appendix F); with the exception of Krista, they responded “yes.” I then asked them why and they provided reasons that linked to the mixing of geography and science. I specifically asked if the mixing of subjects was considered valuable (I focused on the descriptor, mixing, as this was the term used by Mr. Norris and Ms. Wade). I believe this is different from asking students if they enjoyed the unit (e.g., hands-on, group work, whole class discussion, etc.). This was an important distinction for Krista; her negative comments were not directed at the integrating of subjects, but the types of activities used in the geography class. Consequently, I feel confident that students felt it was easier to learn because it was integrated. In contrast, I am not as confident that students found this unit relevant because it was integrated.

While students may have commented that they felt this integrated unit was relevant, this may have been due to numerous factors. Students may have found this integrated unit relevant because of the actual curriculum content, because Ms. Wade was focused on students being able to use this knowledge in the future, or because it was integrated. In retrospect, I needed to question students further with regards to why they
felt this unit was relevant. As it stands, I can share that students found this unit relevant; this may or may not have anything to do with curriculum integration.

This then moves me into my third and final discussion in relation to theme five (students valued this integrated unit). My lack of probing regarding why students felt this unit was relevant means that I am unable to comment on whether students’ valued integration as a curriculum opposed to an instructional strategy. As an instructional strategy, students positively identified that integration made learning easier. However, I have no evidence to support the claim that any form of integrated knowledge (e.g., knowledge of how these two subjects were connected or bridged) was valued by students. Unfortunately, I am not alone in my inability to comment on the value of integration as curriculum.

Articles or chapters that discuss integration as its own curriculum (e.g., Drake, 2000; Grossman et al., 2000; Relan & Kimpston, 1993) do not appear to describe actual teacher practice or student reports. In contrast, articles that do discuss the actual implementation of integrated units (e.g., Bintz et al., 2006; Czerniak et al., 1999; Diem, 1996; Flowers et al., 2003), providing teacher and (sometimes) student perceptions, do not discuss integration as curriculum. One article that does attempt to examine actual practice while also problematizing integration as curriculum is Venville et al. (2000). In their examination of student problem-solving, Venville et al. discuss differences between discipline knowledge and students’ ability to bridge knowledge when needed. However, while they present an argument for the value of integrated knowledge, this argument is not linked to student evaluations of curriculum integration. Consequently, I agree with Grossman et al.’s (2000) assertion that there is a paucity of research that directly connects
discussion of curriculum integration as theory with curriculum integration in practice—especially in relation to the perceptions of students engaged in integrated units.

Having discussed the research (or lack of research) in relation to students’ valuing of this integrated unit, I know turn my focus to theme six. Rather than looking at student perceptions regarding this integrated unit, I report on a myriad of comments surrounding a specific method utilized in this integrated energy unit.

**Theme #6: Hands on learning opportunities were beneficial**

In my post-unit interviews with students, after asking them what they thought of participating in an integrated unit, I asked students to comment on specific activities within the unit. Across the board, students were extremely positive about the group work in science when they got to work with materials. Students commented that they enjoyed “putting everything in order” (Leah final, p. 2, referring to organizing the electricity pictures from source to home) and that they “liked just working with the people” (Ryerson final, p. 4). When discussing the walk around the building and picture taking, Jamie shared that “like you can put this, it’s kind of like a puzzle, like you put the steps together and like learning what the things do” (Jamie final, p. 3). Ms. Wade also commented on their enjoyment in her post-unit interviews.

You know personally I like this one. Ok, the strips where we had to go outside and take the pictures and they had to walk around the school and stick the pictures on, it was very early on and it required a lot of questions like so that’s why they’re (laughs) but I still really liked it and I liked the end product. I think that I would definitely, if I was to do grade nine Applied again I would start off the unit exactly the same way, I would do that again. They had…a lot more fun than I realized that they had…They really were, and if you look at the pictures of them all, they were very focused. I think they really like making things light up so I think maybe next time if we could get different coloured LED lights and make it a little bit more fun, and I would’ve liked to do a few more hands on. I think things with them, getting them to actually, they never actually did a
parallel circuit. I did it and I showed them, but I would like them to make a parallel circuit and I’d like to get better circuitry for them. (FSI, p. 7)

Specifically referencing the 3-D model home project, Daniel shared that constructing it was valuable because “it put it into perspective of what was going on…and there were ways in which our house could be more green and save more energy” (Daniel final, pl 4). Leah also commented on the model home project and electrical circuit experiments, sharing that she enjoyed that “we got to do it ourselves…making it” (Leah final, p. 4).

Overall, Abram felt that “it was the good combination with learning and having fun” (Abram final, p. 7).

Of all the students, Krista was the most vocal in her final interview regarding how much she valued the group work with materials in the science classes. She shared that “Ms. Wade explained it and we did it in partners, and we all got to do it together so it was easier and I understood it more” (Krista final, p. 2). In contrast, she was very negative about the lack of group work with materials in Mr. Norris’ geography classes. She said that Mr. Norris “handed us a sheet and sent us off to work and I wasn’t really clear what to do and then I just ended up asking other people and it took longer” (Krista final, p. 2).

Krista shared that this lack of engagement also affected her ability to retain information that she had learned in the geography classes.

Well, I learned, like, the different kinds of power, like wave, hydro, solar, thermal, nuclear. Like those things, but, like, I forget what they do and, like, I don’t really—it didn’t really like—like I knew it at the time and now I just don’t really know. (Krista final, p. 3)

While other students were not as critical of the geography classes in their final interviews, they were not as excited to share about the activities they were involved in.
My classroom observations of student discussions and engagement throughout the unit support these student perspectives in their post-unit interviews.

All three of the science activities involved some type of small group work with materials and in all three of these activities, students’ observed levels of on-task behaviour were higher than in the geography classes (refer back to percentages of on-task behaviour in chapter 4, Table 3). As demonstrated in Figure 2 above, student on-task behaviour was, in some cases, significantly\(^5\) higher in the science classes. Beyond simple

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\(^5\) The vertical axis refers to the 95\% Confidence Interval (CI). An observation that the student was on-task was recorded at 1 while an observation that the student was off-task was recorded as 0. As a result, the
measures of on- or off-task behaviour, comments by students during their science classes provide additional support for their positive assessments of the hands-on nature of the group work with materials.

For example, when working with Jamie, Krista was the first to get the light bulbs to turn on when experimenting with the wires, battery, and lights. Both girls were very excited and Krista was able to accurately describe what was happening. She commented: “It doesn’t matter which one [wire] touches the side, just one of them has to touch the side and one of them has to touch the bottom…and people say we’re stupid…come on. Who’s the one who got the light? That would be me” (obs5, p. 2)!

This excitement with learning was also evident when I asked Krista to explain what was happening throughout her experiences. She was very excited to share what she was learning:

Res: Do you think it would matter if you changed the direction of one of these [batteries]?

Krista: Yeah, because…

Daniel: Maybe we should try…oh, I’m confused here. You mean positive to positive…flip this around…

Jamie: Oh, so does it matter?

Res: Do you think it’s going to work?

Krista: No.

higher the bar, the more on-task the student was observed. The circle in the centre of each bar represents the mean or average score for on-task behaviour. The error bar stretches out from the mean to include 95% of all observations. Anything beyond the error bar would be considered so far from the mean that there was a statistically significant difference. Using Figure 6 as an example, because the error bar for “energy sources” is so much lower than the “getting electricity” error bar (with no overlap), students were significantly more on-task during the “getting electricity” activity than they were during the “energy sources” activity. Note that both geography (E sources, E locations) and science (Getting E, Conserving E, Model Home) activities are included.
Res: Why?

Jamie: Because opposites attract.

Krista: No, it’s because…they’re the same I think.

Res: So would there be any movement of electrons?

Krista and Jamie: No.

Krista: No, because it can’t get from the battery. (obs10, p. 3)

During this activity, Jamie identified that being able to get their light bulb to light up was “such a happy moment for us” (obs5, p. 2). Ms. Wade’s observations shared this enthusiasm.

Krista and Jamie…I’m impressed. They really got it together this electricity unit and I think they both really enjoy electricity…and I think they survived themselves…Instead of them thinking of themselves as dumb girls, they actually understand stuff and developed more of a power by what they learned. (FSI, p. 12)

Students were just as excited to work with the voltmeter as they were to work with the batteries and lights. Students were successful at relating their measurements to their conceptual knowledge of power even though they found it challenging to understand what the numbers on the ammeter meant (involving math skills to understand measurements to the hundredths). Regardless, students again commented on this being a very quick lesson. Even working with the electricity bills that Ms. Wade brought in during her energy conservation activity was considered interesting as students were able to relate the work they did with electrical circuits to real life situations such as wiring a house, paying electricity bills, and monitoring their own power usage. Even though the energy bill was just a piece of paper, it represented a material that students got to work with and discuss with partners.
The hands-on nature of the activities also appeared to lead to opportunities for Abram (the only ESL student) to contribute and share whereas little opportunity existed during the geography activities. For example, when Mr. Norris asked students to identify where on their individual maps they would find each energy source, Mr. Norris expected students to use their worksheets to do this. Abram did not understand how to get the information he needed. He then sat there waiting for assistance without asking for it. Unless the teacher happened to notice Abram sitting there looking confused, he did not receive help. The only time I did hear Abram’s voice during whole class discussions was when he was asked a direct question (e.g., in science class Ms. Wade asked Abram to explain on-demand heating, an appliance common in Europe). When he answered, Abram was soft-spoken, but confident, appearing happy to contribute in class. Mr. Norris shared that, for Abram, “language [was] his key issue” (FSI, p. 11). In contrast, Abram did get involved in the small group work in the science classes. He would ask questions (e.g., “Where is the electricity in here” [obs3, p. 1]?) and made the periodic suggestion (e.g., during the electricity strips he made suggestions regarding the order of the pictures and removed any duplicate pictures that would not be used).

Linking theme #6 to research literature. Based on student perspectives shared after this integrated energy unit, student comments made throughout the unit, and my observations of student engagement, the hands-on activities that were incorporated into the science portion of this integrated unit were very well-received. Students were surprised at how quickly time would pass (e.g., Jamie commented that “this class went by so fast” [obs5]), often referring to these classes as fun and exciting.
That the hands-on nature of small group work with materials is engaging for students is not surprising. Instructional manuals for teachers routinely identify the value of incorporating hands-on work with a variety of materials to increase student engagement and enjoyment (e.g., Darling-Hammond & Bransford, 2005; Jones & Jones, 2010; Levin, Nolan, Kerr, & Elliott, 2009; Parkay, Hardcastle Sanford, & Gougeon, 1995). What is important to note is that hands-on activities are not synonymous with curriculum integration.

As noted by Applebee et al. (2007), Adler and Flihan (1997), and Drake (2000), teachers do not implement the same teaching practices in their integrated units. While there is a tendency for teachers implementing integrated units to incorporate more student-centred, collaborative activities, it is only a tendency and not a given. As such, studies of curriculum integration reporting on high levels of student motivation need to clarify what was motivating. In this study, students were positive about having subjects integrated and these comments were separate from the more overwhelmingly positive comments regarding Ms. Wade’s use of hands-on materials with small groups. Given the range of teaching practices utilized in curriculum integration (as evidenced even here in comparing Ms. Wade’s group work with Mr. Norris’ independent seat work and lectures), it is important that reports of student enjoyment are clarified—what benefits do students experience because they are participating in integrated units vs. what activities do students enjoy when participating in integrated units?

Third question summary

My third question asked, what are the students’ perspectives on learning in this integrated setting? My analysis of results against current research literature illuminates
two important considerations for researchers. First, we need to value the voices of our students more. There is a paucity of results regarding student perceptions beyond summary comments that they enjoyed or were engaged during a unit. We need to move beyond just counting levels of on-task behaviour, recording their group work, and asking them general questions on a survey. All of these are important measures, but they do not enable students to share their perspectives nor explain their assessments. I believe student assessments of each aspect of an integrated unit are just as important as the teachers and researchers involved, yet we do not allocate the same attention when we discuss these results in our papers.

Second, when we allocate the appropriate amount of attention to these voices, we learn a key distinction between comments regarding integration and comments regarding activities. In this study, students did not know anything much about integration before the unit while afterwards they were able to discuss specific benefits to having these two subjects linked together; they found it easier to learn and relevant to their own lives. They could see how they would be able to use what they learned about science and geography outside of the classroom. These comments were separate from their excited remarks on how much they enjoyed the hands-on activities in Ms. Wade’s science classes.

Integration and type of activity are two different things. When asking students (and arguably teachers) for their perspectives, it is important that researchers distinguish between these two concepts. If not, positive reports regarding integration may have little to do with the integration of subjects and much more to do with the types of activities those teachers implemented.
Research Question #4: How do Students Perform Academically in this Integrated Setting and what Issues Relate to this Performance?

My fourth and final question relates to students’ academic performance in this integrated energy unit. What knowledge were students able to demonstrate by the end of this unit in relation to the six curriculum outcomes (i.e., types of energy sources, pros and cons of different energy sources, location of energy sources in Canada, how electricity gets from its source to our homes, using electrical circuits, and energy conservation)? What evidence do I have of this learning? When was this evidence demonstrated? These are important aspects of student academic performance and I use my classroom observations as well as post-unit interviews with my pre-selected students to address them.

The seven students that I followed for this case study demonstrated an increase in their ability to retrieve and recall knowledge related to the six unit outcomes. Consequently, these students experienced academic success. I interviewed these seven students prior to the start of the unit and, with the exception of Daniel who had some understanding of how electrical circuits worked and that there were different types of energy sources, the students were unsuccessful at answering questions related to the unit’s curricular outcomes (see Appendix B for the initial student interview protocol). In contrast, throughout the unit and in the post-unit interviews, students demonstrated that they were able to retrieve and recall knowledge regarding these outcomes with greater accuracy. While this may not be surprising, I believe that incorporating a pre- and post-measure of student academic performance is important. Without a pre-measure of academic knowledge, I would be unable to identify whether any improvement in recall or
recognition had actually occurred throughout the unit. As was the case with Daniel, he knew a great deal of the curriculum content prior to the start of the unit. Consequently, I can report that, while he was successful at demonstrating that he knew the academic content at the end of the unit, this success was not primarily because he participated in this unit. He entered the unit with much of that knowledge. In contrast, I can confirm that the other six students did not know much in relation to the curriculum outcomes prior to the start of the unit. As a result, I can be more confident in my assertion that six of the seven students acquired the necessary curriculum knowledge because of their involvement in this unit. My first theme for this question focuses on the fact that students were academically successful in this integrated unit. My second theme focuses on two key conditions that emerged as critical in supporting students’ academic success.

Theme #7: Students were successful at retrieving and recalling academic knowledge

This theme focuses on students’ ability to retrieve and recall information regarding the curricular outcomes at the conclusion of the unit. I specifically use the terms retrieve and recall for this theme. As discussed in chapter two, there are many different ways to evaluate student learning. Retrieval occurs when students are able to accurately answer a question when given a prompt (e.g., multiple choice questions or true/false questions); the answer is there, they just have to identify it. Recall occurs when students are able to answer open-ended questions accurately; the answer is not there and students must recall it independently. In contrast, transfer (or application) occurs when students are able to independently access knowledge and use it in a new situation. Transfer is different from recall in that recall gives a specific question that guides the
student to the knowledge that is needed. Transfer provides a situation or problem and students need to determine what knowledge they have that is relevant so that they can bring it forward.

For this case study, only recall and retrieval questions were used to evaluate student academic performance. While the 3D model home project completed in science class would constitute an opportunity for students to transfer knowledge to a new situation, this assignment was not used as an evaluation tool for student learning as it was a group project. The Ontario Ministry of Education (2000) explicitly identifies that group projects cannot be used to evaluate and report on student progress as evidence of individual performance is unreliable. Consequently, I discuss student success on the 3D model home project in theme #8.

For this case study, three separate evaluations of curriculum outcomes were completed.

1. **Geography test:** For the last day of geography class, students completed an oral review and took a one page written test containing primarily retrieval questions (e.g., fill-in-the blanks using a word bank and matching questions).

2. **Science test:** On the last day of science class, students completed an oral review and took a four page written test containing an equal number of recall and retrieval questions (e.g., multiple choice, fill-in-the blanks, and open-response items).

3. **Final interview:** After the completion of both the science and geography classes, I completed one-on-one interviews with each of the seven pre-selected students. Given the staggered progression of the unit, this oral interview was completed two weeks after the geography written test had been completed and two to three days after the completion of the science written test. My interview contained primarily retrieval questions (e.g., open-ended response questions).

The results for these three evaluations have been summarized in Table 4.
Based on interviews completed prior to the start of the unit, only Daniel had knowledge of different energy sources and electrical circuits. When comparing this lack of knowledge prior to the unit to the post-unit evaluations, all students demonstrated an increase in the amount of accurate knowledge they could retrieve and recall regarding the curricular outcomes. As noted by both Ms. Wade and Mr. Norris, this group of Applied

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The geography written quiz was out of 20 while the science written quiz was out of 36. The second row for each student reports on student achievement for the verbal interview (see Appendix F for the final student interview protocol). The following standards were used for the interview: ME = meets expectations = accurately answers all questions; AE = approaching expectations = accurately answers only some of the questions; NM = not meeting expectations = unable to accurately answer most of the questions.
students performed much better on their written tests for this unit than previous geography or science tests.

When comparing student performance on the written tests and the corresponding parts of my oral interview, there was a relative degree of consistency. For Peter, Daniel, and Leah, the scores on their written quizzes matched their interview ratings. For Ryerson and Abram, discrepancies between their written tests and oral interview appeared to be influenced by their own learning challenges. Ryerson, my one student with designated learning disabilities, performed better on his oral interview when compared to his written tests. Given his challenges with reading and writing, this was not surprising; the opportunity to talk was beneficial for Ryerson, enabling him to share more knowledge verbally than in a limited period of writing time.

Abram, my one ESL student, performed better on his geography written as compared to his science written. Given the amount of reading and writing required for the science test, this is not surprising. He did much better in the science part of the interview which enabled him to use materials and pictures to answer questions. In contrast, he did not perform as well on the geography portion of the interview when compared with his geography test score. Given the amount of spontaneous vocabulary required for the questions (e.g., having to name different provinces in Canada without having them written in front of him, having to label energy sources as traditional, renewable, alternative, and non-renewable), this may have hampered his success.

Jamie’s scores matched for her science objectives, but varied for geography. Jamie missed her geography test and rushed through it several days later without a review, while she performed better on the geography portion of her interview. Even
though it was two weeks later, Jamie was able to recall a great deal of knowledge regarding the geography objectives. It is possible that, not feeling rushed, Jamie was able to share more of her knowledge. However, it is also possible that, having completed the model home project which included some geography content, Jamie had experienced the review she avoided when taking her make-up test.

In contrast, Krista’s written test scores did not match her oral interview. Both written tests scored in the 70% range; however, she dramatically underperformed on the geography portion of her interview and excelled for the science portion. During her final interview Krista had been quite negative about the geography portion of the energy unit (as discussed previously in this chapter). When we got to the geography academic questions, Krista’s quick response was, *I don’t know.* When asked to try, she was resistant, instead commenting again on how she was not able to remember anything at that time because it was all just talking and worksheets. She felt too lost to remember information. In contrast, Krista was very excited about the science activities, and during the academic portion of her interview Krista gave a number of examples for each science question. It is possible that the verbal nature of the interview enabled Krista to share more of her science knowledge as compared to the written test.

Consequently, in light of specific incidents (e.g., Jamie rushing through her written test, Krista’s negative feelings towards geography), there was a level of consistency between written test scores and student oral interviews. In some cases, specifically for students with learning challenges, the oral interviews revealed more knowledge regarding the academic outcomes than the written tests.
Given this consistency between different evaluation measures, I can report with confidence that students were more successful at demonstrating accurate academic knowledge after the unit when compared with pre-unit assessments. I can also report that their level of success was greater than previously completed non-integrated units. However, it must also be recognized that I cannot definitively identify why these students experienced this success. There were a number of factors, some related to the structure of this integrated energy unit and some related to other aspects of the unit, which may have affected their performance on final unit evaluations.

There were a number of issues related to the fact that this was an integrated unit that may have influenced student learning. First, students reported that they enjoyed this unit more than others (as reported in student post-unit interviews). Second, students reported that they were able to understand a larger picture, recognizing how science and geography were linked together. This may have made it easier to remember concepts after completion of the unit. Third, students reported that they believed this unit was more relevant to their future; they could use what they learned when making decisions outside of the classroom. This may have increased their knowledge retention.

However, a fourth reason for students’ academic success, completely unrelated to the integrated nature of this unit, could be due to having both teachers provide an oral review the same day they completed their written tests. As discussed in chapter five, this was a concern for Mr. Norris. While I would argue that having the review and the test on the same day was not a significant factor regarding student academic success given that, a few days (and in the case of geography, a few weeks) later, students were just as
successful at demonstrating knowledge of all curricular outcomes during their oral interview with no review just prior, it may still be an issue worthy of consideration.

A fifth reason for improved student academic performance when compared to previous units relates to the fact that the students were the objects of research; I was in the room, asking questions and, sometimes, answering student questions. My very presence altered the classroom environment (Creswell, 1998) and may have affected student performance. As I have now briefly overviewed a variety of issues regarding the interpretation of students’ overall academic performance, I turn my attention to a comparison of students’ science and geography performances.

Improved performance may have been due to the large number of hands-on small group work that had been incorporated into the unit. As discussed by Applebee et al. (2007), while many integrated units contain more hands-on small group work than non-integrated units, that factor is teacher dependent. All students commented, both during class and in their post-unit interviews, on how much they enjoyed these hands-on opportunities. Based on the results shared in Table 4, students performed even better on the science written test and interview questions than geography. Perhaps the hands-on small group work and not the nature of curriculum integration is the most pertinent consideration in relation to student academic success.

Consequently, a number of different issues need to be considered when examining students’ academic performance. Additional research examining these different considerations utilizing a more quantitative approach (including control groups) may be useful in examining those aspects that were the most critical for improved student performance.
Linking theme #7 to research literature. As noted earlier in chapter two, there is a paucity of research on curriculum integration that reports on students’ academic performance in relation to curriculum outcomes. The majority of articles instead discuss higher levels of student engagement and attendance (e.g., Berlin & Lee, 2005; Bintz et al., 2006). My results support these articles; students in this case study were more engaged and motivated by this energy unit than in previously completed units. However, while common sense would suggest that increased student engagement should lead to increased retrieval and recall of concepts, I do not have results that can confirm or contradict this assumption.

For those studies that did report improved student performance in relation to academic outcomes (e.g., Flowers et al., 2003), if successful academic performance was discussed, it was done generally rather than specifically. Even fewer studies examine why student performance may have been affected. Nuthall (1999) is an exception, reporting that when academic concepts were covered a minimum of three times with no more than two days between each reference, students were more successful at recalling academic knowledge at a later time. My results would support this finding; Mr. Norris’ repeated references to science concepts were consistent with higher recall of academic knowledge. Another interesting exception, Ross and Hogaboam-Gray (1998) detail how, while students’ ability to problem solve and apply knowledge to new situations (transfer) was higher with students involved in an integrated unit (as compared to those in a control group), this improvement was not also revealed on written tests requiring simple recall of academic objectives. Results from my study challenge Ross and Hogaboam-Gray’s results; my students did experience more success with simple recall. However, whether
students would experience increased success for higher level knowledge and/or problem solving remains unclear. This would be an interesting extension to include in further studies of curriculum integration.

**Theme #8: Cross-class discussions contributed to academic learning**

It is important to clarify what I mean by academic. I am referring to content that is congruent with the unit outcomes (e.g., knowledge of energy sources and their pros and cons, able to describe how electricity arrives at our homes in a useable form, etc). This is in contrast to any social, emotional, or integrated outcomes that have been previously discussed. For students, academic learning was not only demonstrated at the end of the unit (as discussed in theme seven), but it was also demonstrated throughout the unit when they were able to contribute meaningfully to a class activity or discussion. Student responses during class discussions demonstrated that they were able to retrieve and recall information they had already been exposed to in a previous class; Mr. Norris discussed specific content related to science concepts in his geography class and, when Ms. Wade initiated discussions with students in her science class, students were able to recall information.

These cross-class discussions represent specific examples of students engaged in curriculum integration—regardless of the activity, students’ discussions were crossing discipline boundaries. This resulted in a feeling of personal success for the students involved in this energy unit; they felt they knew stuff. An additional aspect to these cross-class discussions (besides the fact that they existed) was the environment in which they occurred. Students shared concerns about feeling stupid, and having a safe environment that they could share their ideas in was important. In relation to this theme regarding
cross-class discussions, I discuss two important aspects: crossing discipline boundaries were positive experiences for students and a safe learning environment was important.

_Crossing subject boundaries were positive experiences._ Several times throughout the energy unit, discussions that occurred in Mr. Norris’ geography class were used to answer questions posed to all students in Ms. Wade’s science class. In each case, when Ms. Wade asked her questions, students’ heads would pop up as if in surprise. Their hands would go up with an exclamation like, “Oh hey, I know that” (Peter, obs11). In some cases, students were unable to recall when they had learned the answer they were sharing and would need to be reminded that the concept originally emerged in geography class.

One of the first examples of students using knowledge from geography in science came in the second lesson for the unit. Ms. Wade was showing a PowerPoint presentation to illustrate the path of electricity from source to home. One of the first pictures showed a nuclear cooling tower. When students were asked if they knew what this was, Ms. Wade was quite surprised that students shared that it was one of those “coal burning” places to make heat into energy—she had not expected students to have such a reasonable response. This was due to a picture from Mr. Norris’ previous class. During his class he had shown a picture of a thermal power plant with similar smoke stacks. In that same class, the visual for the nuclear power plant focused on the plant itself and did not include any cooling towers. Ms. Wade then discussed this comparison with students, telling them about the nuclear cooling towers. Students were nodding their heads up and down linking it to Mr. Norris’ reference to Uranium city.
Another example occurred in the eleventh class of the unit. Ms. Wade built a series and parallel circuit for students in science class. When Ms. Wade created the parallel circuit, one of the bulbs further away from the batteries was less bright. When asked why, Peter shared that this was because the further energy had to travel, the more energy got lost. When Ms. Wade asked Peter to share where he had learned that insight, he assumed it had been in science. When it was noted that it was in geography class, many of the students remembered discussing it in relation to moving energy from Uranium City to Toronto.

During the model home project, all students utilized knowledge they had learned in Mr. Norris’ class to identify a location-appropriate type of energy (given the province they were assigned) that was preferably renewable. As Peter commented in his final interview, his group used what they had learned in geography to make the best decision.

I just realized that we had to pick a place. I think I agree ‘cause we learned about the places in geography. Like, we picked Saskatchewan and then Mr. Norris and Ms. Wade, they told us it was flat. So we used wind power and since we knew that Saskatchewan was flat ‘cause of geography, it helped pick what kind of power to use. (Peter final, p. 5)

In addition, when students were putting together their model homes, each group paid special attention to specifying how the turbine worked to generate the needed electricity. In her final interview, Ms. Wade commented on how impressive the detailed turbines were.

I think we did, I mean because one of the projects they did in groups they had to use materials that they had in the room, power from generation, from source to where you use it in your house and so you know, and then I said, ok, you're in Ontario, you're in BC, you're in Sask., you're in Nova Scotia and so Nova Scotia picked tidal, Sask. picked wind, BC would've probably picked hydro, and they were able to justify it based on location so.....you know so, and they were also talking about things turning when they did the dam, when they did the wave energy, or the tidal, they
actually created a little generator, they said ok, the water is going to come up here, it’s going to go down this little hill, this little hole, as it goes down this little hole the blades are going to turn they are going to spin and generate electricity, so they were able to do that and they learned that in your [Mr. Norris’] class not in my class. (FSI, p. 4)

By using the discussions and lectures in Mr. Norris’ geography class, students were able to answer questions and contribute to the activities and discussions that occurred in Ms. Wade’s class. Consequently, Mr. Norris’ focus on mentioning and reinforcing science concepts in his geography class enabled students to experience positive academic success in Ms. Wade’s science classes. As Ms. Wade did not refer to geography concepts in her science classes (with the exception of having students use geography concepts for their final project), students were unable to take information from their science classes to use in geography.

While I did not observe students contributing knowledge they had learned in science in Mr. Norris’ geography classes, he did enable students to contribute to discussions by asking them to share personal experiences with energy sources (e.g., asking students about a local laundromat with solar panels, referring to the wind turbines on the highways, etc.). This was a conscious effort on behalf of Mr. Norris. As noted in chapter five, Mr. Norris believed that Applied students were *worldly* and he enabled students to contribute in his geography classes by asking students to share that knowledge.

*A safe learning environment was important.* With both of the aforementioned types of contributions (by using knowledge from one class to another, sharing personal experiences), students were able to respond to their teachers’ questions with some degree of confidence. Students, in general, were not guessing; they were recalling or retrieving.
Comments from both the students and the teachers reveal that providing support for building student confidence was important.

For example, both teachers felt Peter would do very well in Academic classes (“I told Peter that he should be going for Academic Social Sciences because what is happening is he’s doing every else’s notes in class” [Mr. Norris, FSI, p. 11]), but that he chose to stay in Applied because he needed the support of his friends. Leah, who excelled on all tests yet rarely said a word in class, was terrified to contribute in class.

Leah is so hard to read because she is so quiet. I cannot read Leah; it's really, really hard… she's so quiet, even when I get a smile from her, or if I get a little bit of feedback…and it was so painful for her to explain when she was doing this…just the little bit that she had to explain on the 3D project. (Ms. Wade, FSI, p. 12)

Similarly, Daniel was extremely bright, successfully demonstrating accurate knowledge of unit objectives both before and after the unit. However, he was very unsure of himself, often requiring a great deal of prodding to share a response. Ms. Wade commented that Daniel suffered from a great deal of insecurity. In her final interview, Ms. Wade shared that:

Yeah, I don’t know. He’s very insecure and he’s very unsure of himself and always wants reinforcement, he’s always coming and asking, am I doing this right, is it right? (FSI, p. 11)

To further illustrate, in his pre-unit interview, when asked to define integration, Daniel replied that he did not know. When asked to guess, he shared: “I don’t think so. I’m afraid I’ll be wrong” (Daniel pre, p. 1). When asked if geography and science had anything in common, he would only answer, “maybe” (Daniel pre, p. 1). Daniel’s hesitation to answer questions persisted when asked what energy was.

Res: What is energy?
Daniel: Energy? … I don’t know how to put it in words exactly.

Res: Can you give me some examples of different kinds of energy?

Daniel: Electric energy, like what powers our computers or phones or static electricity. I don’t know. Energy… I’m not sure. (Daniel pre, p. 1)

While not as successful on academic tests, Krista was also very self-conscious. Numerous times throughout the unit Krista would make comments, worrying that she might look stupid. For example, when writing down her group’s brainstorm of possible ways to conserve energy (science), she announced at the beginning that: “if I spell something wrong, do not laugh at me” (obs13, p. 1). In addition, she was repeatedly heard asking, is that right? Am I right? This occurred before she handed in worksheets or finished her projects. During both her pre-unit and post-unit interviews, Krista would repeatedly comment that she didn’t know or wasn’t sure; however, with consistent prodding, asking Krista to try, she would often come up with an accurate response.

Jamie similarly referred to herself as stupid; however, rather than trying to avoid answering questions, Jamie was quick to respond. Her responses finished with an, I don’t know or maybe. This willingness to approximate or under-cut her responses was consistent with the attention Jamie paid to doing well in class. To illustrate, when it came time for the geography test, Jamie was away and missed the review session that occurred the same day. A couple of days later, when Mr. Norris ran into Jamie, he noted that she needed to take her test. He offered to help with her review and gave her the folder of work she had done to date. Jamie said no, preferring to get the test done immediately and out of the way. As a result, she received a low mark (55%) on her test.

As illustrated by the aforementioned examples, the students in this Applied class had difficulty with academic self-confidence. Consequently, providing opportunities for
students to feel confident in their ability to share worthwhile responses in class, by either relying on personal experiences or using discussions from one class to answer questions in another class, was important. To support these contributions in class, Ms. Wade provided additional support to students.

When having students prepare their electricity strips or model homes with the rest of the class, Ms. Wade quizzed each group extensively, ensuring that there were no errors or misconceptions. When asked to comment on this teaching practice, Ms. Wade revealed that this was a specific strategy for her Applied students.

Well, because I, one, I’ve got time constraints. So, if they get up here, I don’t want them to end up with misconceptions in the end. So, if I’m trying to address it when they’re putting their posters together. Also, they don’t…they sort of have…they don’t like being wrong. So, if they’re up here and it’s wrong and some kids…and these kids love pointing out mistakes… ‘well no, you can’t put that there because’ … and then, would sort of make fun of these guys up here because they put something in the wrong order. And then, they would end up having these guys yell, and these guys would feel kind of stupid if they put something in the wrong order. And I don’t want that happening. And these guys would be very quick to point that out, if they knew. Because, these guys are so quick to point out each other’s mistakes, I think, because they’re always, I don’t know. It has to do with self-esteem. (obs3, p. 1)

In addition, when students were feeling overwhelmed by a task, Ms. Wade would also provide a great deal of encouragement, not allowing students to give up. For example, when having students complete a worksheet to calculate power (voltage x current), students put up a great deal of protest, complaining about their inability to do math. Ms. Wade raised her voice and challenged the class on this perception. She emphasized the value of being able to do mathematics in the science classroom and shared that research had shown that attitude was more important to learning than almost anything else; those students who tried, learned from their mistakes and did better the next time. Students
were still concerned with looking stupid. Ms. Wade then took students through the first problem as a whole class, modelling all of the instructions. The class then completed the worksheet on their own. By the end of the lesson, Ms. Wade commented on how proud she was. She asked students if they were surprised with themselves; students said they were. These students needed the safe space to demonstrate their knowledge and this space was created by encouragement, group preparation, and questions that relied on recalling and retrieving.

*Linking theme #8 to research literature.* This group of Applied students had regularly experienced a lack of success in academic classrooms (evidenced through failing grades, decreased attendance, and a lack of assignment completion). This was the primary motivator for these two teachers as they embarked on an integrated unit. As already discussed in this chapter, the majority of students experienced higher (when compared with their performance in previous units) levels of academic success on their written tests and oral interviews. Consequently, Ms. Wade and Mr. Norris succeeded in providing a more positive academic experience for students than they were used to. Bandura (1997) would argue that these two teachers were improving their students’ self-efficacy. Rather than focusing specifically on self-worth or self-esteem, self-efficacy relates to an individual’s belief in his or her own abilities. That sense of, *I can do it,* that enables students to take risks when learning. Bandura’s research has demonstrated that, just as negative experiences contribute to low self-efficacy, positive experiences of success and mastery contribute to a higher level of self-efficacy.

While succeeding on their written tests and oral interviews at the end of the unit (as discussed in theme #7) represented opportunities for feeling successful, I would also
argue that the opportunities students had in class to answer questions also positively contributed to their self-efficacy. By being able to contribute to class discussions, to recall information and be reinforced by their teachers in front of their peers, these Applied students had the opportunity to experience feelings of personal mastery (Hey, I know this) on a daily basis. Given these students’ comments regarding being stupid, being worried about making mistakes, and being unwilling to share an answer they were not positive about, they demonstrated a lack of self-efficacy that could limit student contributions in class. However, having just learned about a concept and hearing that same language in the next class provided enough of a safe space to enable students to take a risk and contribute. Consequently, while Mr. Norris was focused on reinforcing concepts in two classes to increase student accuracy on final evaluations, that reinforcement also created opportunities for students to feel knowledgeable and take learning risks. I would argue that this goes beyond what would be considered best practice.

Providing a safe learning environment by encouraging students, supporting their risk-taking, and providing opportunities for students to share personally relevant stories are all aspects of best practice (Bransford et al., 2005; Darling-Hammond & Bransford, 2005). These are best teaching practices, not specifically curriculum integration practices. However, I would argue that discussing science concepts in geography so that students were able to recall information in science—this is a practice specific to curriculum integration. Whether curriculum integration is viewed as an instructional strategy (the mixing up of subject curriculum) or as its own curriculum (a form of bridged thinking), there were positive benefits for student self-efficacy. Consequently, it would be
advantageous for research examining curriculum integration to go beyond simply reporting that students were engaged or that they enjoyed an integrated unit and examine self-efficacy as an important issue.

*Fourth question summary*

Across the board, studies of curriculum integration are weak when it comes to discussing student academic performance and the issues related to that performance. Articles and books on curriculum integration have repeatedly demonstrated that integration is not a single method or view of knowledge (e.g., Are disciplines naturally occurring entities or social constructions?) and that teachers do not implement integrated units consistently—teacher practice varies regardless of the type of integration. As already noted, this degree of variation in what is referred to as curriculum integration requires researchers to be very specific about teacher perspectives and their beliefs about integration, as well as the actual implementation of an integrated unit. This same degree of specificity is required when discussing student academic performance.

The most challenging issue with regards to reporting on student academic performance is the lack of a consistent and comprehensive model for evaluation and reporting. Too often researchers are content to report that students were *successful* without providing evidence to support that claim. This is a problem with reporting. In the few studies when researchers do provide evidence of students’ improved academic performance (e.g., providing test scores, providing examples of student responses), the focus is placed solely on final, summative assessments; this ignores both pre-unit evaluations as well as evidence gathered throughout the unit. As illustrated by Daniel in this study, a measurement of pre-unit knowledge is necessary to demonstrate that
students improved their knowledge over the course of the unit. In addition, rarely are reports of student recall or recognition referred to throughout the course of the unit. For this study, not only were student responses throughout the unit indicative of student learning, it also provided an interesting examination of curriculum integration in relation to student self-efficacy.

While this study does provide examples of how researchers can be more comprehensive in their evaluating and reporting (seeking evidence prior to, during, and after the unit), it also illustrates weaknesses that can be learned from. While I sought evidence of student knowledge at numerous points throughout the unit, my evidence focuses on recall and recognition. I would have been more thorough in my examination of student learning to also provide questions or tasks that required students to transfer knowledge. As demonstrated by Venville et al. (2000) and Ross and Hogaboam-Gray (1998), while students may be successful at recall and recognition, they may be unable to transfer knowledge (or the reverse). Examining knowledge transfer would have been beneficial.

In addition, I believe that it is important to gather evidence in relation to academic knowledge as well as learning related to integrated knowledge (integration as curriculum). For both of my teachers, working within a subject-bound high school, they had no specific learning outcomes beyond the six curriculum outcomes outlined by the Ministry. Consequently, their written tests do not ask students to demonstrate any learning in relation to thinking across subject areas. My final oral interviews demonstrated this same weakness. While I did ask students to identify if they felt integration was valuable, I did not seek any evidence of connections across subject areas.
While I was able to report on students’ ability to make connections throughout the unit (e.g., making reference to content covered in geography in science class, using knowledge learned in geography to complete the 3D model home project), I did not further investigate any integrated learning (e.g., using geography knowledge to solve a science problem) in my final interviews. This lack of inquiry into the value of integrated ways of knowing (integration as curriculum) is very typical of current research literature. Currently, in Canada, curriculum is organized by subject area only. I highly doubt that this will change until researchers are able to provide evidence of what integrated knowledge looks like, with some measure of value for that knowledge. If, as researchers, we do not seek evidence in relation to integrated knowledge, I see little change in policy on the horizon.

Having completed an analysis and discussion for each of my four questions, I now turn my attention to summarizing results from my case study of an integrated energy unit at Beachville Public School.
Chapter Seven: Summary and Conclusions

In chapter one I prefaced my four research questions. While there are numerous studies examining curriculum integration, it is very challenging to compare these studies and apply them to teacher practice due to a lack of descriptive context combined with results. A descriptive context includes data from the very beginning stages of a unit—the initial planning and perspectives of the teachers—through to the conclusion of the unit—examining student learning within that context. In addition, there tends to be a focus on either the teachers’ perspectives or the students’ learning; rarely is there an examination of both. In addition, when student learning is discussed, it is often done broadly with sweeping statements rather than detailed results—demonstrating that students lacked knowledge prior to the unit through to descriptions of what they were able to perform at the conclusion of the unit.

Consequently, my overall aim for this study was to provide the detailed context, including perspectives from both teachers and students, from the initial planning stages through to evaluations of student learning and the unit as a whole. By doing this, I have engaged in discussions that examine curriculum integration in relation to both theory and practice. As a result of these discussions, eight themes emerged in relation to my four questions.

1. Purpose is important to teachers.
2. Curriculum integration is worthwhile.
3. Common planning time is important.
4. School scheduling can be an impediment.
5. Students valued this integrated unit.
6. Hands-on learning opportunities were beneficial.

7. Students were successful at retrieving and recalling academic knowledge.

8. Cross-class discussions contributed to academic learning.

I now review these themes in more depth, in relation to my research questions.

Reviewing my Four Questions

My four questions, with two focused on teachers and two focused on students, provided a balance for participant voices. My first question, examining teacher perceptions of curriculum integration, resulted in two themes which spanned the entire unit. By discussing purpose for implementing integration, I gathered data relating to why these teachers initiated this unit in the first place—capturing perceptions that existed even prior to planning. Mr. Norris chose to teach an integrated unit to increase student recall; he wanted students to be more successful academically. Ms. Wade chose an integrated unit to help students better use what they learned in school to solve problems outside of the classroom. Both teachers spoke of purpose while neither spoke of different types of integration. To them, integration just meant working together—mixing subjects together—nothing more.

My second theme regarding teacher perspectives addressed data gathered throughout the unit and during post-unit interviews. Both teachers implemented activities that corresponded to their reasons for integrating. Mr. Norris continually reinforced science objectives in his geography class. Ms. Wade had students build a model home using both geography and science knowledge. Throughout the unit, their teaching practices mirrored their purpose for integrating. This resulted in two different levels of integration: interdisciplinary and transdisciplinary. However, both teachers also
incorporated very different activities. Mr. Norris used a lot of whole class discussion and independent seat work while Ms. Wade used a lot of hands-on activities incorporating the use of materials and small group work. In the end though, both commented on the value of curriculum integration. The reasons they chose to implement an integrated unit were addressed successfully. Mr. Norris cited improved student academic performance while Ms. Wade discussed how students were relating what they learned to life outside the classroom. Even though both teachers were assessing different pieces of evidence, they were both happy with their decision to integrate.

My second question, asking both teachers to identify any issues or challenges when implementing an integrated unit also resulted in data taken from the beginning of the unit, throughout the unit, and upon reflection after completion of the unit. Time and scheduling were problems. Prior to the unit both teachers commented on the challenges of scheduling their courses as well as their course content (their timing had to match). For a secondary school, working with administrators, ensuring they knew that you were interested in integration was important to ensure effective scheduling. During the unit itself, finding time for collaborative planning was also a problem. Upon reflection, both teachers discussed how they needed this collaborative time to coordinate their lessons and keep track of activities in each classroom.

Consequently, my first two questions provided descriptions of teacher perspectives gathered before, during, and after the unit. Throughout the entire span of this unit, the one consistent factor for these teachers was purpose. Their reasons for integrating influenced their activities as well as their evaluations at the conclusion of the unit. Even though they implemented very different practices and utilized different levels
of integration (while not consciously), their purposes for integrating were successfully achieved.

My third and fourth questions focused on student voices; I was very conscious of ensuring the inclusion of these voices as they are often absent in research reports. I gathered student voices before, during, and after the unit. I utilized interviews before the unit to ask students what they knew about integration, why their teachers were choosing to use integration, and to find out what each student knew about the unit’s learning outcomes. Throughout the unit I gathered their voices by recording group conversations, asking them questions, and recording responses during whole class discussions. After the unit, I repeated my interviews, asking students to comment on integration as a whole, each activity individually, and to perform a retest of the academic content of the unit.

My third question focused on students’ perspectives regarding the unit both as a whole and as individual activities. By the end of the unit, all pre-selected students understood what integration was. Similar to their teachers, they described it as the mixing of two subjects together. Students were very positive about curriculum integration. They found it easier to learn the academic content and found what they learned relevant to their own lives. These responses were made specifically in reference to benefits they perceived in having their geography and science classes integrated. When asked about each of the activities throughout the unit, the one consistent theme to emerge was students’ enjoyment with the hands-on learning activities in their science classes. Consequently, the two themes for question three focus separately on the benefits of curriculum integration and the value of hands-on learning. As I discuss later, I believe this distinction is important.
My fourth question focused on student academic performance. Consistent with my overall focus on wanting to gather descriptive data throughout the entire unit, I gathered information on student academic knowledge before, during, and after the unit. My pre-unit interviews revealed a lack of knowledge regarding the unit outcomes. Six of the seven students were unsuccessful at describing how electricity moved through a circuit, were unable to classify different energy sources, were unable to describe how electricity made it to their homes, and were unable to describe ways to conserve energy at home.

My first theme for question four focused on the success that students experienced in their post-unit evaluations. On both the written tests and my final oral interview, students demonstrated that they knew a great deal about the unit outcomes. Across the board, students were more successful than they had been on previous evaluations in geography and science (prior to this integrated unit). They also demonstrated an increase in their retrieval and recall of unit outcomes compared with my pre-unit interviews. However, it is important to note that their success can not be confidently attributed to the fact that they participated in an integrated unit. I address this further when I examine persistent issues below.

My second theme dealt with the demonstration of academic knowledge during the course of the unit. Throughout the unit, I recorded numerous times when students were able to recall information they had heard in one class to answer questions in a different class. These opportunities resulted in cross-class discussions. Mr. Norris’ discussion of turbines and energy conservation made their way into Ms. Wade’s class when she asked questions during whole class discussions. Students seemed almost surprised; Ms. Wade
was asking questions and they had an answer! In addition, during the 3D model home project in science, students were able to use their knowledge of the pros and cons of different energy sources throughout Canada to make decisions based on their provincial assignment. My second theme for question four described how students found these opportunities for cross-subject discussions helped them feel successful as learners, enabling them to have a safe space to demonstrate learning. Data related to this theme demonstrated successful student performance throughout the unit (not just as a summative evaluation at the end) and the positive emotional possibilities that these opportunities provided.

Having reviewed my eight themes in relation to my four research questions, I now examine those issues that persisted throughout this study, making them worthy of note for further research.

**Persistent Issues Regarding Curriculum Integration**

What actually counts as integration? Is there a specific action, event, or method? No, there is not. According to these two teachers, when content was mixed, this was integration. Based on their definition, when Mr. Norris mentioned science content in geography, this was integration. When Ms. Wade had students incorporate geography objectives in their 3D model home project, this was integration. However, in both of these examples, curriculum integration is assumed to be a method of instruction—a way of organizing the content that is taught. This represents a very limited view of integration as discussed theoretically by researchers such as Relan and Kimpston (1993), Drake (2000), Grossman et al. (2000), and Venville et al. (2000).
Reflecting back on this case study, I question when and where curriculum integration occurred. These two teachers viewed their collaboration as curriculum integration. As Mr. Norris commented, just talking about mixing subject areas was considered curriculum integration. However, this collaboration did not continue throughout the unit; a lack of collaboration time was noted as a challenge for these two teachers. Throughout the unit, each individual teacher engaged in his or her own integrated practice; Mr. Norris referenced science content while Ms. Wade’s final project utilized knowledge from both subject areas. These were instances in which these teachers mixed their subject areas. This lends itself to viewing this case study in a variety of ways. Was this a case study simply of two teachers collaborating? Was this a case study of integration engaged in by two teachers? Or was this actually two case studies, each examining the integration practices of two separate teachers? These questions encourage researchers (and teachers) to question what we mean by integration.

The challenge of not complicating what we believe curriculum integration is ensures that integration remains nothing more than a method. If integration is nothing more than a method or teaching strategy, then curriculum documents that focus solely on subject-specific outcomes will never change. There first needs to be recognition that integration can be more than a method—that an integrated way of knowing the world is an outcome in and of itself. After that, researchers will need to gather evidence that an integrated way of knowing the world is valuable and worthy of placement in curriculum documents. This placement can take many forms.

Looking at Ontario curriculum specifically, the most important alteration to curriculum is the inclusion of cross-curricular (or integrated) outcomes. In each grade, for
each subject area, a minimum of one outcome could focus on integrated ways of thinking. For example, in secondary social studies courses, there could be an outcome as follows: student is able to identify how knowledge and skills from other subject areas can be used to solve problems. By including outcomes within the curriculum ensures that teachers will include integrated ways of knowing into their teaching. Consequently, text books and resource guides would then be created to address these specific outcomes. In addition to including specific integrated outcomes, provinces could provide an appendix in their curriculum documents that make connections between outcomes in different subject areas (similar to the social studies curriculum in the Northwest Territories). This would assist teachers in making connections between subject areas.

Once this inclusion of integrated outcomes occurs, teachers will be able to begin to work with an integrated curriculum, supported by provincial resources, with clear guidelines for the evaluation of student learning. It may even be possible for high schools driven by subject-specific scheduling to become more flexible so that teacher collaborations on integrated units are more supported. Rather than working in isolation, teachers will be supported by curriculum as well as policy.

To gather the evidence necessary to demonstrate that curriculum integration is worthy of greater policy consideration, researchers need to be much more diligent in their examination of student learning. We require a comprehensive model for examining and reporting on student learning (e.g., Black & Wiliam, 1998; Earl, 2003). This model needs to span the entire length of an integrated unit, including evidence gathered before, during, and after the unit. Both curricular and integrated outcomes need to be examined, with attention paid to gathering evidence of student recall, recognition, and transfer of
knowledge. There are a myriad of possibilities for why students’ academic performance may improve over the course of a unit. Even for this study, it was impossible for me to report that students successfully learned more because they participated in an integrated unit. It worries me that articles, sharing less data than I have here, make blanket statements reporting increases in student learning in integrated units—as if they are sure that integration is the reason for this success. As researchers, diligence when it comes to examining and reporting on student academic performance is imperative to developing a strong literature base that would support curriculum change in relation to integration.

**Study Limitations**

As already noted, this is not a study that can report on cause and effect. My focus was on the description of a single case study. As a result, generalizations beyond these two teachers, twenty-three students, and their geography and science classes are not possible. Instead, it serves as an opportunity to open additional questions regarding curriculum integration, illuminating several areas in need of further study (e.g., incorporation of an assessment model for integrated units; a focus on the purpose teachers have for implementing an integrated unit and how that relates to their implementation of different activities; a stronger link between what counts as integration, what counts as integration in practice, and how the success of an integrated unit is determined). While this may limit the opportunities that researchers and teachers have to use my study to inform their own practices, I have tried to be as descriptive as possible with the context and the issues that arose so that, where possible, connections can be made to the field.
It is important to note that my descriptions are filtered through my voice. Perhaps, rather than viewing my study as a description, I should refer to it as an interpretation. It is my retelling of this unit. I have tried to punctuate my interpretation with numerous quotes from students and teachers to demonstrate both the respect I have for their voices, as well as provide some level of legitimacy for my own construction. However, it still remains my interpretation; a different researcher may have noted different aspects and derived different themes from the same data.

Another researcher would also have interacted with these participants in very different ways. By asking and answering questions during each of my visits, I developed a strong, trusting relationship with these teachers and students. In many ways this enabled me to gather very rich responses during our final interviews; my participants knew and trusted me. However, one of the consequences of this engagement with participants is a blurring of boundaries. How much did I affect my own results? Instead of reporting on my observations of two teachers implementing curriculum integration in their classrooms, I could have examined this as a study of professional learning on behalf of myself and the two teachers I worked with. Together, the three of us explored and implemented curriculum integration; our relationship was reciprocal in nature. As a result, our understanding and appreciation of curriculum integration grew.

My interpretation and understanding of curriculum integration, affected by my own experiences and biases, represents my story; a story describing the time I spent with Ms. Wade, Mr. Norris, Peter, Ryerson, Leah, Krista, Abram, Daniel, Jamie, and 16 other remarkable students. I came into this study as someone who has implemented her own integrated units and found them to be powerful and effective. This was a bias. I have
emerged at the end of my story a little more hesitant. Is it a method or is it a connection that makes this experience powerful? Personally, I will spend a great deal of time examining this question, dissecting my own teaching experiences with integration against what I have learned from my time at Beachville. My goal is that other researchers and teachers can do the same.

My Final Thoughts

As I conclude my dissertation, I reflect back on my experiences with the aim of sharing what I feel are the most pertinent nuggets for researchers specifically examining curriculum integration to take away.

First and foremost, something extremely important to both my own practice as well as this study is the value of student voice. Consistently, research examining curriculum integration places value on the voice of the researchers, some on the voices of the teachers, but rarely if ever are student voices ranked equally. Including a student comment from a group discussion here or there, reporting on whether a student demonstrated a curricular outcome, or reporting numbers from a student survey minimizes student voice. Students remain the object of study shown only as a product rather than a participant with ideas regarding integration. If we research curriculum integration in classrooms we should be asking students what they think integration is, what they value and what they do not. In this study, student responses revealed different reasons for valuing this energy unit—some related to specific activities while some related to actual integrated practices. Students were also given the opportunity to comment on how the unit was evaluated. Krista had very strong opinions with regards to
why she performed as she did on the end of unit evaluations. Without giving students a voice, this information, this perspective, would be lost.

Second, as the perspectives of the two teachers involved in this study illustrated, it is not enough to document the integrated practices of teachers. As researchers we also need to probe into why teachers are choosing to implement an integrated unit. The methods these teachers chose and how they evaluated the success of the unit hinged on why they chose to implement this integrated unit. Their decisions had nothing to do with how they defined integration, nor were they even aware that there were different ways of describing integration. For Ms. Wade, this resulted in a lack of congruence between how she and Mr. Norris referenced each other’s discipline specific knowledge. In retrospect, I could have encouraged more discussion about why they were implementing this unit and how that would relate to their own practices. That discussion may have been very informative and positively affected the implementation of this energy unit. I strongly encourage all researchers to engage the teachers they are working with in conversations regarding why they are implementing integration and how they see that affecting how they implement and assess their unit.

These conversations are critical for researchers as we have a different perspective from teachers, often one more focused on the epistemological aspects of curriculum integration. For example, when reflecting back on my experiences with this integrated unit, Why should teachers integrate curriculum? What value does it have? For my two teachers, the value related to student academic performance. In contrast, I wonder about the value of curriculum integration in relation to the development of active and informed decisions. Similar to Beane (1995, 1997, 2005), with the focus on using knowledge from
a variety of disciplines to solve problems, are students better able to contribute to society? Is it acceptable to have this as the reason for choosing to use curriculum integration, independent of student performance on discipline specific outcomes? Are we able to justify this rationale given the current curriculum focus on separate subject areas?

What about a focus on a holistic understanding of how to live and be in the world? Curriculum integration, by linking across subject areas, provides a broader view of the world focused on using knowledge and skills to reach goals. What we can do with outcomes becomes more important than a demonstration of outcomes. For me, I believe that integrating curriculum for the sole purpose of improving academic performance is too limited. If that is the only reason for integrating, why bother? There are numerous other methods or activities that improve student performance. Best practices such as constructivism, discovery learning, working in groups, and sharing assessment criteria with students will all increase academic performance. These best practices can be implemented and student improvement achieved without integrating curriculum.

Underlying this discussion is the question of whether integration is just simply best practice. Was Ms. Wade simply demonstrating good science teaching rather than curriculum integration? Can we separate these two ideas? I believe that we can. I can implement numerous best practices (e.g., sharing assessment criteria, providing visual and verbal cues, breaking down instructions, providing opportunities for students to explore different manipulatives, etc.) without making (or having students make) connections between subject areas. I believe that curriculum integration is focused on the links between disciplines, enabling us to examine issues and problems from a number of vantage points, increasing the knowledge and skills we can bring to solving both local
and global problems. As such, this case study has reinforced for me the importance of examining integration as more than best practice, more than a way of increasing academic performance, but as a way of better knowing the world around us.

Third, in relation to assessment and evaluation, as researchers we need to be more comprehensive in how we approach the evaluation of student learning, as well as the evaluation of curriculum integration. Having a quick survey, a quick test, or a simple interview is not enough. Learning itself is complex. The questions that we ask, when we ask them, and how we ask them, all of these affect the results that we obtain. We need to aim for variety in our questions, we need to be explicit about the type of knowledge we are seeking, and we need to examine the many different opportunities that exist to assess learning. I strongly encourage working from a comprehensive model, such as the WNCP’s (2006) assessment as, for, and of learning as it is rooted in teacher practice while providing a diverse landscape of considerations. Perhaps, when we are more comprehensive in how we examine student learning, we will be able to adequately describe the complexities of curriculum integration. It is not just the mixing of subjects. It is a complex weave of different teaching strategies, different conceptions of knowledge, and different ways of knowing the world. I would argue that the less we try to minimize and shrink the concept of integration and how we assess it, the more accurate we will be in understanding all of its strengths and pitfalls.

Fourth, and finally, in recognizing the complexity of curriculum integration, I urge researchers to resist the need to reduce the work that we do into short little articles here and there. Given the intricacies of student learning, teacher perspectives, and curriculum integration itself, as a community of researchers, description is paramount.
Only with comprehensive descriptions can one study effectively inform another. If I report on student learning, do my readers know what I mean by learning? Are the perspectives of my teachers clear? Is their purpose for implementing curriculum integration obvious? Have the activities and strategies of my teachers been made apparent? Are the voices of my students transparent? As a researcher, are my beliefs about curriculum integration evident? To succeed on all of these fronts requires a dedication to a thorough and detailed description. Researchers of curriculum integration represent a community of learners and comprehensive descriptions are important aspirations for all of us. I hope that I have met this call and I hope that my nuggets, like stones tossed into the lake that is research literature, create ripples that can be seen in future questions and studies of curriculum integration.
References


Virtue, D.C., Wilson, J.L., & Ingram, N. (2009). In overcoming obstacles to curriculum integration, L.E.S.S. can be more! *Middle School Journal, 40*(3), 4-11.


Appendix A
Initial Teacher Interview Guide

Date: ____________________ Researcher: ____________________ Site #: ______

Hello and thank you for taking the time to meet with me. Please remember that you do not have to answer any question that you do not feel comfortable with and we can stop at any time. Do you have any questions before we begin? Let’s proceed.

1. How would you define integration in the classroom?
   - Can you provide some practical examples in a classroom context?
   - What do you think are the key features of integration?
   - Why do you want to do an integrated unit?
   - Explain previous experiences with integration?

2. Please describe the integrated unit you will be using for this study.
   - What is your sequence of activities?
   - What do you see your role during these activities? (specifically, role during group work)
   - How is it you see your subject areas being integrated in your activities?
   - What do you see this unit teaching your students about society, and their role in society, as a whole? How?

3. What are you going to assess in terms of student outcomes?
   - Discipline specific
   - Integration specific
   - How and when are you going assess these outcomes?

4. How are you grouping your students together and why? For the students you have pre-assigned, what expectations do you have?
Appendix B

**Student Pre-unit Interview Protocol**

Take picture of student.

1. What do you think integration means? You’re about to start a unit on electricity that your geography and science teachers are working on together. Why do you think they’re doing that? Do you think geography and science have anything to do with one another? If yes, how; if not, why not?

2. What is energy? Where does it come from? Are there different kinds of energy? If yes, what are they; if not, how do you know? If they answered yes, are some kinds better than others? Why or why not? [Interviewer: if they don’t give examples, ask for them.]

3. Looking at this map of Canada, where are different sources of energy found? [Interviewer: make sure you say out-loud where on the map the student is pointing.] How do you know this?

4. Take a look at these pictures, what do you think they all have in common? What are some differences? If you were to group them by similarities, how would you group them and why? [Interviewer: be sure if students just point at a picture without naming it, you need to say what it is for the recording.]

5. When you’re at home and you turn on the TV, where does the energy come from to turn it on? How does it get to your house? Where does it come from?

6. Take a look at this picture [electrical circuit], what is this called? What’s happening in this picture?

7. Do you think it’s important to try and conserve energy? Why or why not? What are some ways that you could conserve energy? Ways the school could conserve energy? What about Ontario? Canada?

Thank you. Do you have any questions for me?
Map of Canada
# Appendix C

## Integration Project Observation Record

Date: __________  
Visit #: _____________  
Observer: ___________

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<thead>
<tr>
<th>Time (5min)</th>
<th>Classroom Context</th>
<th>Obj</th>
<th>Act</th>
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<th>Group One</th>
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**Science/Tech Objectives**
- S1: Describe electrical circuit
- T2: Explain how electricity gets to home in a useable form
- T3: Describe ways of conserving or greening energy

**Geography Objectives**
- G1: Identify traditional and alternative energy sources
- G2: Discuss pros/cons of different energy sources and how they affect Canadians
- G3: Identify where energy sources are in Canada

**Integration Objectives**
- I1: See connections between subjects
- I2: Use knowledge to make wiser energy choices

**Activity**
- W: Whole class discuss
- G: Group work
- I: Independent work
- O: Observation

**Question Rating**
- 0: Listen/absorb, no ?
- 1: Close-ended ?
- 2: Varied response
- 3: Open-end, no right answers

**Integration Rating**
- 0: No connections
- 1: Refer other subject
- 2: Explain complement
- 3: Shared content without distinguishing
Appendix D

Final Teacher (Geo) Interview

1. Mr. Norris…Please describe for us your general impressions from this unit. What were its strengths and challenges? Is there anything you would do differently in the future and why?

2. Mr. Norris…Has your view of integration changed at all? If so, how? What do you think are the key elements of an integrated unit? How do you think that relates to the activities you did with the students?

3. Looking at the Geo activities in two sections (power sources and locating power sources in Canada), Mr. Norris…please describe: (a) How motivated were the students to complete this activity and why? (b) How focused do you think the students were on the learning objectives for this activity? How do you know? (c) Do you think that students could apply what they learned from this activity to a new situation? Why or why not (what evidence do you have)? (d) What evidence will you use to decide if a student has or has not met the learning objectives? Examples please.

4. Both teachers…What have been the benefits and challenges to collaborating together for this unit? What would you do differently next time?

5. Both teachers…could you please discuss how you will be using the Geo to continue building on the Science…looking towards the final project?
Appendix E

Final Teacher (Sc) Interview

1. You mentioned earlier that you chose to do an integrated unit with this class because it was applied...why did you want to try an integrated unit specifically with an applied class? How are students tracked/assigned to the applied class? How do you feel an academic class would have done/benefited from the integrated unit?

2. Looking at the objectives for the unit (including the integration objectives)...do you feel they were met? What evidence do you have for that?

   Explain electrical circuit
   Explain how electricity gets to home in a useable form
   Describe ways of conserving or greening energy
   Identify traditional and alternative energy sources
   Discuss pros/cons of different energy sources and how they affect Canadians
   Identify where energy sources are in Canada
   See connections between subjects
   Use knowledge to make wiser energy choices

3. [Using pictures of activities for recall.] For each of these activities, can you please share how motivated you felt students were? How aware were students of the connections between geography and science for each activity? How beneficial this activity was to student learning?

4. Please comment on each student’s strengths and challenges in relation to both the learning objectives and your integrated objectives.

5. What were the benefits and challenges to working with a research team for this integrated unit? How could we have been more helpful to you during this unit?
Unit Overview:
1. We are going to talk about the unit you just finished with your geography and science teacher on energy. What were the main things you feel you learned in this unit?

2. What did you learn in this unit that you think will be helpful for you in the future, if anything? Why?

3. What do you think about having your geography and science unit linked together...better, worse, no different? Why?

Specific Activities
4. For each of the following activities, start by asking students what they learned during the activity. Then read out the question for students and ask for their rating (Strongly Agree – Strongly Disagree...see next page). Ask for follow-up examples for each question.

Sequence of Activities:
   a. Types of energy (Geo)
   b. Electricity comes home (Sc)
   c. Energy in Canada (Geo)
   d. Circuits (Sc)
   e. 3D project (Sc)

Content Activities
5. Using these materials, please build a parallel circuit for me. What are the names for each of these things and what do they do? How could you turn this into a series circuit?

6. Please order these pictures and then explain to me why you ordered them that way (electricity from plant to home).

7. Looking at this map of Canada, please label where you would find different energy sources. Why can we find energy there? (Ask for a number of locations)

8. Looking at these pictures of different kinds of energy, please tell me what kind of energy it is. (a) traditional and alternative energy sources. (b) renewable and non-renewable.

9. What are some of the advantages and disadvantages to solar power? Hydro-electric power? Thermal power?
10. Do you think it is important to conserve energy? Why? Did you learn anything new in these classes to help you conserve energy? What did you learn?

I really enjoyed working on this activity
☐ Strongly disagree ☐ Disagree ☐ Agree ☐ Strongly Agree

I learned important things from this activity.
☐ Strongly disagree ☐ Disagree ☐ Agree ☐ Strongly Agree

I will use what I learned during this activity in the future.
☐ Strongly disagree ☐ Disagree ☐ Agree ☐ Strongly Agree

Learning this was easier because my science and geography teacher worked together.
☐ Strongly disagree ☐ Disagree ☐ Agree ☐ Strongly Agree