Interdisciplinary Education in the Elementary Curriculum: Exploring Teacher Perceptions and Practices

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Abstract

This research study focused on interdisciplinary education practices in elementary schools and classrooms. The main research question was: how does a sample of Ontario elementary educators design and implement interdisciplinary lessons in the classroom, and what outcomes do they observe from students? This question was investigated using semi-structured interviews with two elementary educators working in schools in Ontario. Findings of this study suggest that a variety of subjects can be combined in an interdisciplinary curriculum, but certain subjects should be taught in isolation. Furthermore, educators identified external frameworks and published materials that were useful resources for educators planning interdisciplinary curriculum. Another finding was that participants identified clear starting points for planning and assessing an interdisciplinary curriculum. Recommendations arising from this research are that teacher education should explicitly address interdisciplinary education. A whole school approach is also more supportive of teachers in their interdisciplinary practices and consequently, administrators may want to consider adopting school-wide interdisciplinary practices. Finally, teachers looking to implement interdisciplinary practices in their classroom should seek out opportunities to collaborate with other educators in order to plan a cohesive interdisciplinary curriculum.

Key Words: Interdisciplinary curriculum, cross-curricular, elementary education
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Chapter 1: Introduction

1.0 Research Context And Problem

Interdisciplinary education and its benefits for students has been a point of discussion for over a hundred years; however, more recent research provides evidence of the observable benefits of interdisciplinary education (An, Capraro & Tillman, 2013; Santau & Ritter, 2013). Interdisciplinary education connects typically distinct subject areas such as Math, Literacy, Music, and Science, by situating the disciplines in real life problems that require combining skills and understanding from the different subject areas (Brand & Triplett, 2012; Santau & Ritter, 2013). By connecting different areas of study, interdisciplinary education aims to facilitate greater conceptual understanding in students than if they learned content from each subject in isolation (Brand & Triplett, 2012; Campbell & Henning, 2010). Students learning in interdisciplinary settings performed better on state tests and had greater social outcomes than students learning the same content without an interdisciplinary approach (Cunnington, Kantrowitz, Harnett & Hill-Ries, 2014). In addition to understanding of content, students develop critical thinking skills and a sense of pride and empowerment (Muthersbaugh, Kern & Charvoz, 2014). For example, in a study conducted by An et al. (2013), students learning math and music in an integrated curriculum understood course content better and performed better on assessments after intervention.

Models of memory also support the notion of interdisciplinary learning. If information is learned with related cues, prompts to reenact instruction or physical cues, recall and recognition was higher than for information learned with unrelated cues or without physical cues (Bowler, Gaigg & Gardiner, 2007; Mecklenbräuker, Steffens, Jelenec & Goergens, 2011). The implications of these findings are that learning occurring in context as well as experiential
learning is subject to better retention and recall. In addition to this, more information learned at a semantic level is recalled than information processed at a phonological or physical level (Craik & Lockhart, 1972; Henderson, Weighall & Gaskell, 2013). Presenting information in a semantic context allows students to understand its importance, and consequently, retain the information better than if it had been processed at a more superficial level (Henderson et al., 2013).

However, there is not necessarily a consensus on whether integrated lessons benefit all students. One study found that at the elementary level, students exposed to interdisciplinary lessons were not found to have significantly different perceived knowledge from students without interdisciplinary instruction (Campbell & Henning, 2010). The levels of critical thinking observed in previous studies is not always replicable; a study on an interdisciplinary university course found that students provided superficial answers to questions, and tended to recite professors’ views instead of solving problems on their own (Orillion, 2009). A further argument against interdisciplinary education is that students require enough background knowledge from each discipline to then approach interdisciplinary topics and problems (Orillion, 2009). This then requires that information be presented from each discipline in isolation before combining perspectives, which contradicts the actual intention of interdisciplinary education. Consequently, a divide emerges in existing literature on the benefits of interdisciplinary education, and multiple viewpoints and findings should be considered when discussing the topic of interdisciplinary education.

Acquiring the skills to effectively implement interdisciplinary instruction is challenging, since teachers have to understand the content well enough to make connections between the different disciplines before presenting information to students (Brand & Triplett, 2012; Santau & Ritter, 2013). Furthermore, understanding how students learn is important, since instruction
should align with students’ ways of learning. Conceptual understanding is crucial to mastering knowledge and skills, and problem-solving approaches enhance learning and understanding, so teachers should use this information to inform their classroom practices (Brand & Triplett, 2012).

There appears to be limited research on interdisciplinary education in practice, particularly in elementary schools (Santau & Ritter, 2013). One problem with research on interdisciplinary education concerns teacher preparedness and the execution of lessons. Teachers feel that they do not have the necessary knowledge and skills to teach interdisciplinary lessons, and can find making connections across disciplines challenging (Barry & Schons, 2004; Brand & Triplett, 2012; Santau & Ritter, 2013). In practice, teachers often connect only two disciplines; this does not fully embody interdisciplinary education (Brand & Triplett, 2012). Superficial connections result in part from teachers’ discomfort or unfamiliarity with subject matter. A potential solution to this problem may be collaboration between teachers with different areas of expertise, which they can combine to design integrated lessons (Carrier, Wiebe, Gray & Teachout, 2011).

Another challenge facing teachers wanting to integrate their lessons is the failure to recognize opportunities to build connections between disciplines (Santau & Ritter, 2013). Since the curriculum is already divided by discipline, planning lessons across the curriculum can be challenging and consequently a barrier to successful integrated education (An et al., 2013; Brand & Triplett, 2012; Santau & Ritter, 2013). A requirement of many standardized curricula includes the implementation of standardized tests or measures; a fixed curriculum based on these tests can make it difficult for teachers to move beyond the curriculum expectations, and teachers may have limited support from their school administration (Brand & Triplett, 2012; Santau & Ritter, 2013). The structure inherent in schools often makes implementing interdisciplinary instruction challenging for teachers (Carrier et al., 2011). This structure reinforces the idea that knowledge
is fragmented and consequently, students see disciplines as distinct rather than interconnected, which does little to encourage learning to solve interdisciplinary, real life problems (Alahiotis & Karatzia-Stavlioti, 2006; Carrier et al., 2011). Another challenge to implementing interdisciplinary education is teachers require time to collaborate and plan lessons, but since students visit different teachers for certain classes like Physical Education or music, teachers rarely have coinciding prep periods in which to plan (Barry & Schons, 2004).

Despite the numerous challenges facing teachers in implementing interdisciplinary education, strategies adopted by schools and individual teachers can inform and guide the practice of other teachers to help them overcome barriers to successfully planning and teaching interdisciplinary lessons.

1.1 Research Purpose

Given the apparent difficulty of successfully implementing interdisciplinary education in the classroom despite research highlighting the benefits of such lessons, the purpose of this research is to investigate how a small sample of elementary teachers is creating and taking advantage of opportunities for interdisciplinary instruction, and to learn from them what outcomes they observe from students. Since there is no universal model for what interdisciplinary education looks like, and consequently some disagreement on whether students learn effectively in an interdisciplinary environment, investigating observed student outcomes will contribute to literature that can help other teachers decide whether they want to adopt interdisciplinary practices in their classroom.

One method for effective enactment of interdisciplinary lessons is formal training for teachers before they go into the classroom (Campbell & Henning, 2010). However, since formal
training is not necessarily available to all practicing and future teachers, sharing the strategies used by teachers currently practicing interdisciplinary education could also inform the practice of teachers already looking to bring interdisciplinary teaching into their classrooms.

1.2 Research Questions

The main question guiding this research is: how does a sample of Ontario elementary educators design and implement interdisciplinary lessons in the classroom, and what outcomes do they observe from students? Subsidiary questions include:

• How do these teachers understand the meaning of ‘interdisciplinary curriculum’ and why do they believe that it is important?
• How did these teachers develop an interest and competence in designing and teaching interdisciplinary lessons?
• What challenges do teachers face in planning and teaching interdisciplinary lessons?
• Which subjects do teachers choose to combine and why?
• How do teachers assess learning in interdisciplinary lessons?

1.3 Reflexive Positioning Statement

My own experience of interdisciplinary education at university has guided my interest in different formats of formal education. Two classes in particular presented me with real life problems that we were expected to propose viable solutions for by the end of each course. One problem was the presence of toxic algal blooms on Lake Mead. Learning about tests of and solutions to problems in water quality provided us with background knowledge required to tackle the problem. However, the culminating assignment required a justified policy proposal, at least
one suggested solution to the problem, and the potential costs of the solution. This required skills and knowledge from a variety of disciplines, as opposed to only content learned in the class. While extremely challenging, the assignment produced viable solutions to the problem, as well as an understanding for course content in a real life context, which made what we had learned meaningful. This course is just one example of several that challenged myself and other students to draw on and combine knowledge across disciplines.

As a result of these experiences, I am curious about how interdisciplinary instruction can be implemented in elementary classrooms. Subjects are typically distinguished from each other, and in my own elementary experience as well as teaching experience, classroom teachers often switch between subjects such as Language/Literacy, Math, Science, and Social Studies with minimal, if any, connections between them. Given my positive experiences with interdisciplinary education, I acknowledge that I am biased in favor of research that confirms the benefits of interdisciplinary education. As a result of this awareness, however, I believe it is also extremely important to investigate whether or not teachers do see positive student outcomes in their classrooms, and whether they attribute these potential positive outcomes to the implementation of interdisciplinary teaching. I also am aware of the need for teachers to know their students, and that certain formats of education may not work for all students in a classroom.

1.4 Preview Of The Whole

To respond to the research questions, I will be conducting a qualitative research study using purposeful sampling to interview 2 educators about the strategies they use to teach interdisciplinary lessons in elementary classrooms. In Chapter 2, I review the literature in the areas of designing and implementing interdisciplinary lessons. Next, in Chapter 3, I elaborate on
the research design. In Chapter 4, I report my research findings and discuss their significance in light of the existing research literature, and in Chapter 5 I identify the implications of the research findings for my own teacher identity and practice, and for the educational research community more broadly. I also articulate a series of questions raised by the research findings, and point to areas for future research.
Chapter 2: Literature Review

2.0 Introduction

In this chapter, I review the literature in the areas of what interdisciplinary education is and how it is applied in classrooms, how it can benefit students, as well as challenges and successes of implementing interdisciplinary education. I start by reviewing literature in the area of debates surrounding the definition of interdisciplinary education in order to identify what model of education and teaching the current research investigates. From there, I discuss models of and research on memory that supports interdisciplinary education, followed by the benefits to students and observed outcomes as well as why teachers would consider implementing interdisciplinary education in their classrooms. Finally, I review the practical challenges facing teachers as well as some successful strategies used in implementing interdisciplinary teaching.

2.1 Definitions

The words “interdisciplinary” and “integrated” are often used interchangeably when describing lessons intended to connect or combine different school subjects in the classroom (Applebee, Adler & Flihan, 2007; Chrysostomou, 2004; Douville, Pugalee & Wallace, 2003; Lederman & Niess, 1997). The terms are used this way because there is no universal model for what each should look like in the classroom (Chrysostomou, 2004). Consequently, there is often confusion amongst researchers and teachers about what integrated and interdisciplinary education is, and since communication on the topic is unclear, successfully implementing either model becomes difficult (Lederman & Niess, 1997). Distinguishing between ‘integrated’ and ‘interdisciplinary’ is important, because researchers often use one or the other, and defining these key words allows further investigation of the topic. Recent research investigating either
integrated or interdisciplinary education has made the distinction between the two terms clearer (Brand & Triplett, 2012; Douville et al., 2003; Santau & Ritter, 2012).

2.1.1 Integrated education

Integration typically refers to the merging of different academic subjects or disciplines to the point that no one discipline can be distinguished from another (Lederman & Niess, 1997). In teaching integrated math and science, for example, it would not be possible to differentiate math content from science content (Frykholm & Glasson, 2005). Blending content from various disciplines in this way is one approach to emulating real-world problem solving and learning, since many fields of study require content knowledge from a variety of traditional disciplines (Lederman & Niess, 1997).

2.1.2 Interdisciplinary education

Interdisciplinary education, like integrated education, still combines different subjects, but the individual disciplines are still identifiable within the lesson, unit or curriculum (Frykholm & Glasson, 2005; Lederman & Niess, 1997). In this situation, an interdisciplinary math and science lesson would clearly have separate math and science objectives and content, but would build connections between the two subjects (Lederman & Niess, 1997). This approach acknowledges that maintaining distinct disciplines may be more realistic for classrooms teachers, and that building meaningful connections between subject areas can make learning more contextual or meaningful for students but still value the individual areas of study (Frykholm & Glasson, 2005; Lederman & Niess, 1997).
2.1.3 In this research

While these two terms refer to different models of teaching and incorporation of disciplines, there is a lack of consensus on which method is ideal; some research argues for interdisciplinary education while others encourage integrated learning (Chrysostomou, 2004; Douville et al., 2003; Lederman & Niess, 1997). For the purposes of this research, interdisciplinary education is the main focus, as true integrated education is often considered challenging to successfully implement (Frykholm & Glasson, 2005; Lederman & Niess, 1997).

2.2 Benefits of Interdisciplinary Education

In addition to understanding the difference between interdisciplinary and integrated education, an understanding of how combining disciplines benefits students is necessary if teachers are to consider bringing the practice into their classrooms. Research on the biological basis of learning and its relationship to interdisciplinary education, as well as observed outcomes in students resulting from interdisciplinary education are outlined below.

2.2.1 Biological basis of learning

Models of memory and learning, as well as research on what learning conditions produce accurate and greater recall can, and should, inform educational practices in schools. The attraction of interdisciplinary education is that students acquire a deeper understanding of content than they would of information learned in isolation (Brand & Triplett, 2012). Models of memory, as well as research on recognition and recall, support this idea (Carpenter, 2011; Craik & Lockhart, 1972; Henderson et al., 2013). The idea that people process information at different levels, depending on how it is received as input, is not new. Models of memory that describe
levels of processing suggest that information processed at a semantic level where connections are made between new information and prior knowledge is remembered better and more likely to be stored as long-term memories than information processed at an acoustic or physical level (Craik & Lockhart, 1972). Research on learning contexts and recall and recognition suggests that information presented semantically, or in a context to understand the information, is retained more accurately for a longer period of time than information processed in a phonological manner, or remembered by its sound (Carpenter, 2011; Henderson et al., 2013).

Another aspect of interdisciplinary learning is that since information is learned in context, students exhibit greater recall (Bowler et al., 2007). Adults with and without high functioning autism have been found to have higher recognition and recall of target words presented with related context words than of target words presented with an unrelated word (Bowler et al., 2007). Similar learning responses as observed in adults have been observed in children aged 6 and 8, so it is possible that the above findings could be applied to elementary students (Mecklenbräuker et al., 2011). If applied to children, Bowler et al.’s (2007) findings suggest that connecting new information to a relevant context or prior knowledge leads to better recognition and recall in students.

Furthermore, learning in a context that encourages physical experience was found to produce better recall in young children (Mecklenbräuker et al., 2011). Students asked to imagine performing an action, with the physical objects present as cues, were able to better recall a list of hypothetical instructions than students learning without the physical cues or instructed reenactment (Mecklenbräuker et al., 2011). These findings suggest that having physical cues present and asking students to at least imagine carrying out actions improves retention of information, which could be related to a deeper understanding of the information (Henderson et
al., 2013; Mecklenbräuker et al., 2011). These findings support the aspect of interdisciplinary learning that encourages experiential learning (Santau & Ritter, 2013).

### 2.2.2 Observed outcomes

The decision to implement a particular practice in a classroom depends significantly on whether teachers observe positive outcomes for their students as a result of the practice. Previous research has found that students have better recall and improved understanding of content when learning in an interdisciplinary classroom setting (Brand & Triplett, 2012; Douville et al., 2003; Santau & Ritter, 2013).

Interdisciplinary classrooms have been found to yield successful student learning (Cunnington et al., 2014; Muthersbaugh et al., 2014; Romance & Vitale, 2012). For example, first and third grade students’ math abilities improved significantly following a five-week intervention where the teachers planned and taught lessons combining math concepts and music (An et al., 2013). Students performed better on math assessments following the intervention, although the researchers acknowledge the challenges of attributing this improvement solely to the interdisciplinary lessons (An et al., 2013).

Similar findings have been evident in programs combining visual art with either math or English. Cunnington et al. (2014) investigated six elementary schools across three years, where the schools were randomly assigned to either treatment or control conditions. Three treatment schools implemented a program that incorporated Visual Arts into the English and math curricula, while three control schools received no interdisciplinary program. After introducing the program, the treatment schools had higher mean English Language Arts and math scores on New York State tests in every year of the project. Following controls for demographic
differences, the researchers concluded that students in treatment schools made “greater learning gains” in both subjects than students in the control schools (Cunnington et al., 2014, 14). Surveys administered to teachers also revealed that teachers in the treatment schools thought the program had positive effects on the students. Another measure compared between the conditions was habit of mind; treatment schools were found to have more growth in practices like reflections by the final year of the project (2011 to 2012), and data collected from student focus groups suggested that treatment schools also produced greater social engagement and development of socio-emotional skills (Cunnington et al., 2014).

Furthermore, incorporating activities and developing skills from different disciplines can lead to greater critical thinking and understanding in students (Muthersbaugh et al., 2014; Romance & Vitale, 2012). Encouraging students to not only look at, but also produce, art about the environment led to reasoning and thought about change in the environment (Muthersbaugh et al., 2014). Similarly, using time previously devoted to isolated reading comprehension instruction to teach science while developing literacy skills provides students with the ability to make meaning of texts they encounter, as well as build connections to prior scientific knowledge (Romance & Vitale, 2012).

### 2.3 Realities Of Implementation

While the theoretical benefits and observed outcomes of interdisciplinary education suggest that teachers may want to consider implementing this type of teaching in their classroom, the reality is that interdisciplinary education is difficult to do well (Carrier et al., 2011; Santau & Ritter, 2013). A university course combining history, English, and economics attempted to develop critical thinking skills and transcend the limits of individual disciplines, but resulted in
students reciting teachers’ views instead of putting forth their own ideas (Orillion, 2009). Since there are no universal models of interdisciplinary education to follow, implementing interdisciplinary education comes with several challenges for teachers to overcome. However, teachers can also draw on specific successful strategies from existing research to successfully incorporate interdisciplinary teaching in their classrooms.

2.4 Challenges Facing Successful Interdisciplinary Teaching

A significant danger facing teachers in designing interdisciplinary lessons is that connections made between disciplines will be superficial (Applebee et al., 2007; Orillion, 2009). For example, playing music in the background while students do math does not qualify as significantly integrating the two disciplines (Chrysostomou, 2004). Combining disciplines has to be authentic in order to be effective, which means that teachers need the necessary background knowledge to facilitate connections between subject areas (Carrier et al., 2011; Lynott, Kracl, Knoell & Harshbarger, 2013). Another potential avenue for superficial connections is that teachers often combine only two disciplines, and frequently choose two disciplines that facilitate easy connections, such as arts and social studies, or math and science (Brand & Triplett, 2012). The danger of using no more than two disciplines is that one subject becomes grounded in the other and used as a means rather than as an equal end in itself (Applebee et al., 2007).

Another challenge facing teachers in interdisciplinary teaching is their lack of preparation. Despite the benefits of interdisciplinary education, teachers often receive limited to no training on how to successfully implement such lessons and are consequently unprepared to do so (Brand & Triplett, 2012; Campbell & Henning, 2010; Santau & Ritter, 2013).
There is also a lack of resources, lack of support, and lack of communication. Creating meaningful interdisciplinary lessons is time consuming, and teachers often do not have the time needed to dedicate to planning (Barry & Schons, 2004; Brand & Triplett, 2012; Santau & Ritter, 2013). For example, teachers of ‘specials’ such as physical education or music only have prep time when classroom teachers are teaching and vice versa, which makes it difficult for all teachers to meet and plan lessons across their respective subject areas (Barry & Schons, 2004). Another lacking resource is the knowledge of specific subject material required to build meaningful connections between disciplines (Applebee et al., 2007; Carrier et al., 2011; Douville et al., 2003). In fact, Douville and colleagues (2003) argue that the opportunities for teachers to implement interdisciplinary lessons are resource, rather than conceptually driven. Teachers also often lack support for interdisciplinary education outside the classroom. Considering the resource commitment required, it is challenging to successfully plan lessons connecting disciplines when curriculum, school, or district standards are imposed on teachers and these do not necessarily naturally align with interdisciplinary learning (Brand & Triplett, 2012; Santau & Ritter, 2013). Failure to successfully implement interdisciplinary learning can be the result of lack of administrative support, in addition to other issues such as superficial combinations of different disciplines (Orillion, 2009). Another reason teachers may receive limited administrative support, since interdisciplinary education is typically considered extraneous to teachers’ primary goals (Carrier et al., 2011; Santau & Ritter, 2013).

2.5 Successful Supports And Strategies

Despite the lack of a universal model for interdisciplinary teaching other than the requirement to combine and connect different disciplines, there are strategies for successful
implementation available from existing research. These strategies are supported by observed positive student outcomes. For example, following curricular reform in Greece encouraging interdisciplinary teaching, elementary schools now include five hours per week allocated as a “flexible zone” (Chrysostomou, 2004, p. 26). This flexible zone is dedicated specifically to interdisciplinary learning using a multidisciplinary textbook (Chrysostomou, 2004). Individual classrooms were given the power to choose what projects or activities to undertake during this time without restrictions to specific disciplines (Alahiotis & Karatzia-Stavlioti, 2006). Following introduction of the flexible zone, most teachers reported that they thought the flexible zone promoted “investigative learning and teaching,” as well as better communication and relationships between different groups in the school community (Alahiotis & Karatzia-Stavlioti, 2006, p. 137). Mandated time to dedicate to projects of student interest, however, is not something teachers themselves necessarily have the power to implement, and serves to highlight the importance of support from the school, board, or district administration for interdisciplinary education. In addition to supports for interdisciplinary education from the wider school community, providing teachers with training to develop and implement interdisciplinary teaching is one support to bringing successful interdisciplinary education to students (Campbell & Henning, 2010). Ideally, pre-service teachers would not only be learning to produce interdisciplinary units, but also learning material in their own interdisciplinary context, as this increases teachers’ content knowledge and can encourage teachers to adopt interdisciplinary practices themselves (Campbell & Henning, 2010; Foss & Pinchback, 1998). Resources to support the planning and implementation of interdisciplinary practices could also be published resources on building connections and strategies supporting interdisciplinary education (Kieff & Bryant, 2005).
Possibly one of the most significant challenges facing teachers is the lack of time available to collaborate and plan interdisciplinary lessons (Barry & Schons, 2004). A solution to this would be school-wide administrative support for interdisciplinary teaching. If the principal and teachers are equally invested in providing interdisciplinary education to students, schedules allowing collaboration between teachers can be developed (Barry & Schons, 2004).

At the level of the individual teacher, particular activities or assignments, as well as methods of presenting interdisciplinary content can help students build connections between disciplines. Specific strategies teachers used to integrate math and science for high school students included using a math journal for students to write about connections between math and science in their lessons (Frykholm & Glasson, 2005). In the same study, teachers coordinated topics and classes with other teachers’ units, as well as planned units with other teachers to produce interdisciplinary units (Frykholm & Glasson, 2005). Collaborative planning is often suggested as a solution to the problem that teachers feel they do not have enough knowledge of a particular subject area to successfully design and teach across disciplines (Carrier et al., 2011).

The strategies mentioned here are not sufficient, however, and neither focus on elementary students nor an Ontarian context. The lack of clear strategies elementary teachers are using to connect different disciplines provides an important avenue for the current research to explore.

2.6 Conclusion

There are significant challenges facing teachers aiming to teach successful interdisciplinary lessons. While there are suggestions for what teachers can do or what schools should do to overcome these challenges, there is a need for more research on what strategies elementary teachers are currently using when teaching interdisciplinary lessons to students. Since
interdisciplinary education has both theoretical and observed benefits for students but no clear universal model, the following research will contribute to providing strategies for teachers to use and adapt for their own classrooms, if they are hoping to introduce or improve their own interdisciplinary practice.
Chapter 3: Research Methodology

3.0 Introduction

In this chapter I review the research methodology of this study and justify methodological decisions made. I begin with an explanation of the research procedure, followed by a description of the instruments of data collection. I then describe my sampling criteria, recruitment procedures and participants of the study. Following this, I explain the data analysis procedure and ethical review procedures, and conclude this section with a discussion of some of the methodological limitations and strengths.

3.1 Research Procedures

This research was conducted through qualitative research methods, using semi-structured interviews to collect data on the topic of interdisciplinary teaching practices and outcomes. Qualitative research attempts to understand the participants’ own experiences, rather than control and predict situations and outcomes, as quantitative methods are more likely to do (Merriam, 2009). The choice in approach reflects the context and topic of study, as well as the desired outcome of the research (Merriam, 2009; Marshall & Rossman, 1999). This research aimed to gain insight into the specific strategies elementary educators use in interdisciplinary education, as well as their perceptions on if and how this way of teaching benefits students. For this particular study, qualitative methods will best provide an understanding of specific teacher practices in their respective contexts. Although not generalizable in the way quantitative research findings may be, results of qualitative research inform researchers about certain topics and themes may emerge that could be transferable to other appropriate situations (Marshall & Rossman, 1999).
3.2 Instruments Of Data Collection

While the study adopted a qualitative approach, the specific method of data collection was semi-structured interviews. Interviews allow researchers to collect details from participants that might otherwise be lost in quantitative measures like surveys (Hermanowicz, 2002). As this research aimed to investigate specific educator practices, as well as the outcomes they observe in their students as a result of interdisciplinary practice, interviews allowed for explanation of specific events or of context that is relevant to the study at hand.

Interviews lasted between 45 and 60 minutes, to prevent participant fatigue (Hermanowicz, 2002). The interview protocol (Appendix B) was designed to investigate different areas of the main research question and sub-questions, and was structured to move the questions in a conversational manner. While the protocol was a list of questions I hoped to cover in the span of the interview, it is important that the semi-structured nature not be eclipsed by this need. There was flexibility to follow lines of thought or ideas raised by participants, as these avenues provided greater insight into the topic or highlighted ideas I had not previously considered (Hermanowicz, 2002).

3.3 Participants

In this section, I review the criteria for participants, the recruitment process of participants, and the profiles of participants in this study.

3.3.1 Sampling criteria

The following criteria aided in determining participants’ suitability in this study:

- Educators currently involved in interdisciplinary education
• Educators may have demonstrated leadership roles relevant to interdisciplinary education

• Educators with at least 5 years of experience in interdisciplinary education

• Educators working in an elementary context (primary and junior grades)

Using a sample of elementary educators implementing interdisciplinary education provides more detail and understanding of their practices than the whole educator population could (Becker, 1990). The above list of sampling criteria was applied to participants in order to ensure their suitability to enhance our understanding of interdisciplinary practices and student outcomes. Participants were currently involved in interdisciplinary education, either in their own classroom practices, or as part of a school movement or philosophy. Current involvement in interdisciplinary practice means that participants had current and relevant insights on interdisciplinary practices. They may have demonstrated leadership in the area of interdisciplinary education, for example, in positions such as principal or curriculum coordinator of interdisciplinary-focused schools. Relevant leadership roles suggest participants’ commitment to interdisciplinary education, a deeper understanding of the topic, and potentially the perspective of other stakeholders in providing interdisciplinary education. Participants should also have had at least 5 years of teaching experience, as their time in the field demonstrates not only their commitment but also their ability to speak to student outcomes and successful practices. Finally, participants were currently working in an elementary context, in order to comment on practices suited to primary and junior students.
3.3.2 Recruitment

Random sampling is typically used for quantitative research and aims to provide a way for researchers to generalize their findings to larger populations. This study, however, focuses on the details of a few individuals’ experiences in order to understand their teaching practices in greater detail, and as such, requires a different method of sampling (Marshall, 1996). Qualitative research may use convenience sampling, purposeful sampling, or theoretical sampling of a population instead of random sampling (Marshall, 1996). This study used convenience and purposeful sampling to recruit participants. Participants were intentionally selected not only because they were accessible and therefore, convenient, but also for their suitability for involvement in this research (Marshall, 1996). Participants’ suitability was determined by the sampling criteria in the previous section. The recruitment process began by contacting an acquaintance in a school known to be using interdisciplinary practices, and connecting to other individuals through their recommendations.

3.3.3 Participant biographies

I interviewed two participants with experience in interdisciplinary education at the elementary level. Participants will be referred to using pseudonyms to maintain anonymity. The first participant, Linda, has 15 years of teaching experience at the elementary level. She taught internationally in the US, England, Hong Kong, and Singapore before returning to an independent International Baccalaureate (IB) school in Greater Toronto Area as the elementary curriculum coordinator. The second participant, Judy, has over 20 years of elementary teaching experience in British Columbia and Ontario. Her current school is in the Greater Toronto Area.
Judy has been the library coordinator at her current school for the last 10 years, and the IB coordinator of the school for the last 5.

I had previously established a connection with Linda and recognized that her role as curriculum coordinator at a school that had already adopted interdisciplinary practices qualified her to speak to this research topic. Through Linda’s connections to educators in similar roles as herself, I made contact with Judy. Both educators have classroom teaching experience as well as more recent experience in coordinator roles overseeing the development and implementation of interdisciplinary curriculum at their respective schools. These experiences provide them with the unique capability to comment on specific classroom practices as well as school-wide supports in the development of interdisciplinary curriculum and its practice in the classroom.

3.4 Data Analysis

Analyzing qualitative data aims to organize the information collected, make meaning of the information, as well as provide an opportunity to develop hypotheses and theories about the particular people and situations studied (Glesne, 2010). There are different ways of analyzing data, depending on the method of data collection and research questions of interest. As this study used semi-structured interviews as the main instrument of data collection, a thematic analysis of these interview transcripts is most appropriate to investigate themes and patterns, as well as differences from certain themes that might emerge (Glesne, 2010). Analysis began during the data collection process, as data should continually be reflected upon; this reflection may produce deeper insights into the topic of study that could be lost or forgotten if only analyzing the data after collection is complete (Glesne, 2010).
As interview data were analyzed, codes were developed to make meaning of the information collected. These codes emerged from the data themselves, rather than from other literature or the researcher’s expectations. These codes were then arranged into hierarchies and as more data were analyzed, more codes were added or reified in their respective hierarchies (Glesne, 2010). Codes were developed by identifying key words or phrases that could be categorized a certain way with respect to the main and sub-research questions. These pieces of information in each category were compared across different interviews and situations, or potentially re-categorized as new codes emerge from the data (Glesne, 2010).

It is important to recognize that the codes were developed through the researcher’s own perspective and understanding of the research, and as such, there is not necessarily one right way to code the data. Despite this uncertainty, sharing preliminary data analyses with participants can inform and confirm interpretation of the data; this sharing of information also fulfills an obligation the researcher has to making sure the story being told in the research is not solely the researcher’s own and disconnected from the participants (Glesne, 2010).

3.5 Ethical Review Procedures

There are evident ethical issues in conducting research, and consideration of these issues can assist in maintaining the integrity of a piece of research (Bryman, 2012). Four main factors of consideration are the risk of harm to participants, the presence of informed consent, invasion of privacy, and participant confidentiality in collecting and presenting this research (Bryman, 2012). I discuss these factors and their consideration as relevant to this particular study. This study received approval from the University of Toronto Research Ethics Board.
In this study of educators’ interdisciplinary teaching practices, there was minimal risk to participants. The study did not investigate participants’ personal identities, although their personal beliefs about education were discussed. While participating in an individual interview may elicit feelings of discomfort for some participants, this topic is not one that would be expected to make participants feel particularly vulnerable or uncomfortable.

In order to make participants feel safe in the interview setting, all participants were required to give their informed consent (Appendix A) to participate before the interview begins, so that they were aware of not only the topic of the research being conducted, but also their rights to refuse a question or withdraw at any point in the study (Bryman, 2012).

I did not anticipate any invasion of a participant’s privacy, particularly since they gave their informed consent to participate, and were aware of their rights as discussed above.

Confidentiality is also often a concern for participants, as they should not be identifiable from research findings (Bryman, 2012). Participants were assigned pseudonyms, and all identifying markers relating to schools, students, and other members of the school community were excluded from the study. As the interviews were recorded, recordings and transcripts, as well as data analysis, are stored on a password-protected computer for up to 5 years before being destroyed. Only the researcher and course instructor have access to this data.

3.6 Methodological Limitations And Strengths

While this study was designed to best approach the topic of learning more about teachers’ interdisciplinary practices and student outcomes, there are several methodological limitations of the current research that should be considered. First, because of the time-consuming nature of interviews and data analysis, the sample size is small. A larger sample might better establish
trends or patterns in findings, but with a sample this size we cannot draw any such conclusions. Second, this study only interviewed educators, and did not involve students or parents. Interviewing other parties in the school community could provide greater insights into the student outcomes and general school environment or practices that contribute to student success in interdisciplinary education. Third, it is important to recognize the level of interpretation of the participants and the researcher impose on the research; however, this interpretive lens is an inherent feature of qualitative research and is not necessarily a significant limitation (Glesne, 2010). Fourth, a result of conducting in-depth interviews with a few participants highlights the fact that these findings are specific to the lived experiences of these participants, and are, as such, not generalizable to all situations.

While these methodological limitations should be considered in understanding this research, several methodological strengths should also be made clear. First, because the interviews are in-depth they allow for rich details to emerge that can inform discussion on the topic of elementary educators’ interdisciplinary practices. Second, this study opts for depth over breadth, so that other educators can gain a deeper understanding of what specific practices other educators are employing in working with students.

3.7 Conclusion

This chapter explored the methodology of the current study, beginning with an explanation of qualitative research and why it is an appropriate approach to the topic of learning about educators’ interdisciplinary practices. I then explained the process of data collection and the place of semi-structured interviews in this research. I then outlined the criteria for participation, recruitment process, and participant biographies, which are followed by an
explanation of data analysis. Participants were selected by purposive sampling given their satisfaction of the recruitment criteria to ensure their suitability to speak on the topic of interdisciplinary practices at the elementary level. I summarized the ethical considerations made for this research regarding any risk participants face, informed consent, invasion of privacy, and participant confidentiality. Finally, I review the methodological limitations and strengths of the current study. Some key limitations include the small sample size of this study, as well as the fact that only educators were interviewed, however, the interview process still allowed for the educators’ experiences with interdisciplinary education to be detailed.
Chapter 4: Findings

4.0 Introduction

In this chapter, I review the findings from interviews with two elementary curriculum coordinators working to plan and implement interdisciplinary curriculum at their respective schools. The findings provide evidence for teacher practices and purposes in interdisciplinary teaching practices. The main question guiding this review is: how does a sample of Ontario elementary educators design and implement interdisciplinary lessons in the classroom, and what outcomes do they observe from students? Five main themes that emerged from the interviews were:

1. Educators defined interdisciplinary education as a combination of teacher practice and skill development;
2. Educators working with interdisciplinary curricula identified people and external frameworks as resources for developing skill and interest in interdisciplinary education;
3. Educators identified individual and institutional challenges to successful planning and implementation of an interdisciplinary curriculum;
4. Educators identified different subjects and expectations that could be integrated or should be taught in isolation
5. Educators use a variety of starting points and assessment formats in planning and assessing interdisciplinary curriculum.

In exploring these themes, I first give a brief explanation of the theme, then report on the participants’ experiences and examples that support each theme, and finally connect participants’ evidence to existing literature on interdisciplinary education.
4.1 Educators Defined Interdisciplinary Education As A Combination Of Teacher Practice And Skill Development

To understand the value and meaning of interdisciplinary education to the participants, their perceived practice, purpose, and benefits of interdisciplinary education are explained below. Understanding what interdisciplinary education means to participants provides context for their practice, but also adds to what educators might generally believe about interdisciplinary education and its benefits. Educators identified interdisciplinary education as a form of teacher practice, that is, teachers actively construct learning experiences to provide students with real-life examples through which to access and connect disciplinary content, engage students in inquiry-based learning in conjunction with interdisciplinary learning, and use disciplinary content to develop skills from other disciplines. Both participants also explained the purpose and benefits of interdisciplinary education as providing students with skills for future success, which include the ability to find, evaluate, and disseminate information, as well as critical thinking skills.

4.1.1 Educators identified interdisciplinary education as a form of teacher practice

An inherent feature and value of interdisciplinary education that was highlighted by both participants was that students are presented with meaningful, real-world issues through which they learn curricular content. Judy explained that in using real-world, or practical examples, teachers get students to research, discuss, and suggest solutions to real situations and problems that actually exist, and that they may not otherwise experience in the school context. An example she gave was the Grade 6 final project at her school. Groups of students selected a global issue to research and present on; these topics never fall exclusively within one school discipline, but involve information that fits into a variety of subject areas. The participants’ mentions of
interdisciplinary education using real-world contexts to access disciplinary content supports research by Lederman and Niess (1997), which explains interdisciplinary curriculum as typically structured around real-life issues.

Another significant part of implementing interdisciplinary education is inquiry-based learning. Both teachers emphasized that interdisciplinary education and inquiry-based learning are inherently linked. Inquiry-based learning, according to Linda, is “interdisciplinary in its approach.” Such an approach is seen, for example, in science education, where scientific inquiry that engages students through experiential learning is combined with content from various disciplines (Santau & Ritter, 2013).

Finally, both educators explained that interdisciplinary education emerges from the way teachers set up their units and lessons. Judy explained that teachers should use curriculum content to develop students’ skills, for example, building certain literacy skills while doing assignments in other subject areas. Prior research on this outcome of interdisciplinary education often investigated literacy skills or math skills acquired, and found that students successfully acquired the necessary skills (Cunnington et al., 2014; Romance & Vitale, 2012).

4.1.2 Educators highlighted the importance of interdisciplinary education in providing students with skills for the future

Judy and Linda both discussed the ability of interdisciplinary education to provide students with the skills to assess and use information. According to Linda, knowing what to do with information is a skill students will need for the future. Preparing students for their futures also speaks to the purpose of education, which Linda stated is to prepare students for jobs that do not yet exist. She argued that because interdisciplinary education presents students with
problems that require a variety of skills and content knowledge to solve, students learn how to find information and assess its accuracy and appropriateness for the task at hand. A second skill for the future that students develop is the ability to problem solve. Linda explained that interdisciplinary education “[teaches] kids how to think. That ‘this is a problem, what are all the skills, how am I going to solve this problem?’” This skills comes from being able to decide what to do with information, as supported by Muthersbaugh, Kern and Charvoz (2014) who found that students displayed greater levels of critical thinking when learning in an interdisciplinary way.

4.2 Educators Working With Interdisciplinary Curricula Identified People And External Frameworks As Resources For Developing Skills And Interest In Interdisciplinary Education

Both participants recognized the importance of external resources to their successful interdisciplinary practices in classrooms and schools. Identifying resources that practicing educators use provides concrete examples to learn from for teachers aiming to bring interdisciplinary practices into their own classroom. These resources included other teachers, who could provide knowledge and support for developing an interdisciplinary curriculum. Another resource identified as a support in the participants’ skill development over their careers were material resources like published frameworks and theories on interdisciplinary education, as well as resources like books on a variety of topics that students could use for research. Finally, participants identified self-reflection and their natural inclination for interdisciplinary education as features of how they developed both skill and interest in the topic, which led to their success and continued work in developing and implementing interdisciplinary curriculum.
4.2.1 Educators highlighted collaboration with colleagues a key part of developing competence at planning and implementing an interdisciplinary curriculum

Judy and Linda both identified collaboration between teachers as a part of successful interdisciplinary curriculum. A key part of the collaborative process highlighted by both participants was the opportunity to learn from other teachers’ content knowledge to build interdisciplinary units. Judy explained that being open to looking at what different teachers are doing and drawing from individual’s strengths “makes a big difference” in successfully planning interdisciplinary curriculum.

Another part of the collaborative process between teachers is team teaching, which pertains to the actual implementation of interdisciplinary curriculum. Linda talked about her experiences team teaching and said that team teaching provides teachers with support and the opportunity to learn from each other whilst working together. Linda’s experiences add to research showing the collaboration between teachers as a support for successfully implementing interdisciplinary curriculum (Carrier et al., 2011).

4.2.2 Educators identified material resources as support for developing competence at designing an interdisciplinary curriculum

In addition to using colleagues as a resource, educators highlighted various material resources as supports for creating successful interdisciplinary curriculum. The first material resource described was the frameworks provided by published educators. Linda mentioned the work of Kath Murdoch (2010) as influential in her understanding, planning, and implementation of interdisciplinary curriculum. Judy, however, identified having physical materials in school as an important part of building successful interdisciplinary curriculum. She explained that having
materials, especially books, on particular topics is important “because the units are built around a central idea” so students “can use [the books] for guided reading or…for independent reading” to learn about their central idea. In describing how teachers successfully plan and implement interdisciplinary education, the use of other teachers for knowledge on subject material is considered a valuable resource (Carrier et al., 2011). Kieff and Bryant (2005) mention resources to draw from in planning interdisciplinary curriculum, but current literature does not frequently reference drawing on material resources for planning interdisciplinary curriculum, although this is another way that teachers can learn from other educators.

4.2.3 Educators highlighted reflection on their own practice as well as ways of thinking as a part of their interest and competence in designing and implementing an interdisciplinary curriculum

Part of the participants’ success and interest in interdisciplinary education arose out of reflections on their own practice and natural inclinations in teaching. For example, Linda argued that “reflective practitioner[s]…understand that the best way to teach is…you can’t teach anything in isolation.” In addition to this, she explained that her natural practice is to build connections and that she has a natural competence to see connections between disciplines. While she did not explain how teachers could develop a competence for building connections, Lynott, Kracl, Knoell and Harshbarger (2013) suggest that teachers need necessary background knowledge of subject areas to build meaningful connections between them. Teachers aiming to develop meaningful and successful interdisciplinary curriculum should avoid only having superficial connections or only connecting two disciplines at a time (Applebee et al., 2007).

Judy also highlighted how her background and work as a librarian meant that she had
experience “partnering” with classroom teachers to do certain units, which combined literacy with content from the various units. She explained that library lessons often involved inquiry, although she did not give examples of how students engaged in inquiry processes in the library. In this case, however, Judy used her strengths and experience to collaboratively create interdisciplinary learning experiences for students, which is often suggested as a solution for the lack of content knowledge individual teachers face (Carrier et al., 2011). Judy identified her role in education as one that seemed to fit well with interdisciplinary practices, which contrasts with teachers’ perceptions of themselves as lacking skills to successfully implement interdisciplinary education (Carrier et al., 2011).

4.3 Educators Identified Individual And Institutional Challenges To Successful Planning And Implementation Of An Interdisciplinary Curriculum

As documented in existing literature on interdisciplinary education, both participants highlighted several key challenges and needs for successful planning and implementation of interdisciplinary education. Recognizing difficulties teachers face establishes a starting point to developing ways to overcome these challenges. An important challenge identified was the lack of time available to teachers, specifically for collaborative planning, as participants had earlier identified other teachers as a resource for success and consequently needed time to collaborate with the teachers. Furthermore, frequent deterrents of interdisciplinary practice are the lack of confidence in various subject areas, and an unwillingness to try new instructional practices if teachers are unfamiliar with interdisciplinary education. Both participants also identified several institutional barriers to successful interdisciplinary practice including inadequate teacher education and limitations imposed on teachers by standardized external curriculum and
frameworks. They also highlighted how the development of education and society has not typically included space or called for interdisciplinary practices, which makes implementing these practices challenging.

4.3.1 Educators identified lack of time as an important challenge to planning and implementing interdisciplinary education

Both educators cited a need for time to collaborate and plan interdisciplinary curriculum, and said that a lack of time was often a significant challenge to doing so. Linda explained that she and her colleagues were constantly “trying to find the time to plan in an authentic way that includes everybody,” but that there was rarely a schedule that allowed them to do so. Judy also highlighted time as a key consideration in the planning process, and explained that her school offered release days for teachers to get together and collectively plan their units. She said that teachers “cannot do this level of collegial work and building a really, truly transdisciplinary unit in a few afterschool meetings.”

A particular challenge to finding time for teachers to collaborate in the planning process had to do with involving specialist teachers. Linda highlighted that “kids are pulled to music and gym and French… and art, and we’re finding links to [those subjects] as well, but that takes more time.” That she found planning with the specialist teachers was difficult suggests that the lack of collaborative planning time acts as a barrier to including certain subjects in an interdisciplinary curriculum. The scheduling conflict between subject specialist teachers and general classroom teachers is documented as a challenge to successful planning and implementation of interdisciplinary curriculum (Barry & Schons, 2004). Furthermore, Brand and Triplett (2012) also highlight a lack of planning time as a significant challenge to planning
meaningful interdisciplinary lessons, which aligns with both Linda’s and Judy’s experiences in their schools.

4.3.2 Educators highlighted teacher self-perceptions as a barrier to successful planning and implementation of interdisciplinary curriculum

Another key barrier to implementing interdisciplinary curriculum that both participants noted was teachers’ lack of confidence and/or an unwillingness to try new practices if they were unfamiliar with interdisciplinary education. Linda explained that for many teachers not educated in an interdisciplinary manner, asking them to teach this way required a “mind shift.” She said that a lack of experience could translate to a lack confidence, which then could stop a teacher from bringing interdisciplinary practices into their classroom.

The unwillingness to try implementing interdisciplinary curriculum is not just a result of lack of confidence. Both Judy and Linda highlighted teachers who may be unwilling to try out interdisciplinary practices because they have established programs and ownership of programs that they may not want to give up. For example, teachers may have a “language, math, science [or] social studies” program and would not have “thought in terms of interdisciplinary” learning. Judy explained that “they’ve probably not thought in terms of interdisciplinary, and… it’s hard for them to give…away their old program.” By developing programs for specific subjects, teachers may not have the knowledge to build connections between the various disciplines (Applebee et al., 2007; Brand & Triplett, 2012).
4.3.3 Educators identified several institutional barriers to the implementation of an interdisciplinary curriculum in schools

Another challenge to implementing interdisciplinary curriculum is institutional barriers. Judy and Linda both highlighted inadequate teacher education—that is, teacher education that does not include interdisciplinary practices. Judy explained that “teachers are not trained to teach like this,” which she argued makes convincing some teachers to take risks and include interdisciplinary practices challenging.

A second institutional challenge identified was the limits that curriculum frameworks and expectations put on teachers’ opportunities and abilities to implement interdisciplinary curriculum. For example, Judy highlighted the Primary Years Program (PYP) from the International Baccalaureate (IB), which takes an interdisciplinary approach to education but “frowns on split grades because [students are] not supposed to have the same unit ever” and consequently, challenges some of the realities of elementary education in Ontario. Attempting to use a PYP framework conflicted with the split grade classrooms in Judy’s school because teachers had to plan units so that students would not repeat any material as they moved through the school, but could still learn in split grade classrooms. Furthermore, board requirements to designate time for language and math instruction directly contradict interdisciplinary approaches to education. In addition to these mandates, Judy discussed how curriculum changes mean teachers and schools have to rewrite their units to fit with specific province-wide expectations. Subject-specific instruction limiting opportunities for interdisciplinary learning supports research highlighting how curriculum standards challenge successful planning and implementation of interdisciplinary curriculum (Brand & Triplett, 2012; Santau & Ritter, 2013).

Finally, Linda also suggested that in addition to inadequate teacher training, the
development and structure of public education do not innately support interdisciplinary education. She argued that public education emerged “because we switched from the agricultural to the industrial age, and we needed to teach people how…to organize.” She added, “transdisciplinary learning is the next step in that evolution,” but suggested that not all educators had yet realized this evolution of education. The standards that are imposed on schools and teachers that require distinguishing school disciplines have evolved out of historical values and purposes for education, and interdisciplinary education counters some of these narratives (Lederman & Niess, 1997). The general unfamiliarity of teachers with interdisciplinary education also points to a lacking teacher education system (Brand & Triplett, 2012).

4.4 Educators Identified Different Subjects And Expectations That They Believe Could Be Integrated Or Should Be Taught In Isolation

The participants also explained how they use different disciplines to create interdisciplinary curriculum. Distinguishing which disciplines educators combine or isolate could provide insight into the context they work in with students as well as ideas for possible combinations and units to other educators. While they identified several examples that suggested language and art skills and content are frequently combined with other disciplines, the participants highlighted that specific strands within different disciplines lend themselves to successful combinations, rather than whole disciplines themselves. Furthermore, they also explained that some disciplines (or strands within disciplines) should be taught in isolation, which suggests that perhaps not all instruction and learning should be interdisciplinary and that there should be space for focusing on one area of study.
4.4.1 Educators identified Language Arts and the Arts as subjects frequently integrated into other subject areas in an interdisciplinary curriculum

Linda and Judy highlighted various examples of combinations of disciplines that they used in their schools, but examples that came up most frequently integrated language and the arts with other subject matter. Judy highlighted her library experience as an easy way to create interdisciplinary learning experiences for students. Even when considering planning units without library components, Judy explained that Language is almost always included in interdisciplinary units. Incorporating Language Arts relates to the development of skills through content provided by interdisciplinary education. Research suggests that Literacy is easier to incorporate into interdisciplinary units because students can develop their literacy skills while accessing information and subject matter on various topics (Romance & Vitale, 2012).

A second subject participants identified frequently in examples of subject combinations was the inclusion of Visual Arts in units on other subjects. Judy described a unit for Grade 4 students that combined the Social Studies topic of physical regions of Canada with an art project that helped solidify students’ knowledge of the provinces and geographical regions. There are varying degrees of subject combination, but Cunnington et al. (2014) describe a program combining Visual Arts, English, and Math and the positive student outcomes in the program, which perhaps justifies this particular combination of subjects.

4.4.2 Educators emphasized the need to combine subject expectations that naturally fit together

Despite the examples of subject combinations described above, Linda emphasized the importance of combining strands and expectations from subjects that naturally fit together. Linda
explained that it is “not the subject, it’s the expectations within those subjects.” She followed this with an example of a Grade 3 Science unit on structures. She clarified that if “they’re studying structures and if you think about your Math strands…geometry naturally fits with learning about how structures are built,” and that when creating a unit or long range plan, those topics would be grouped together. Linda suggests that the combinations have to be intentional and complementary, which reinforces the idea that connections between disciplines should not be superficial but authentic and meaningful in order to truly be interdisciplinary (Applebee et al., 2007; Carrier et al., 2013).

4.4.3 Educators indicated that some subjects or expectations should be taught in isolation and that full integration is an unrealistic goal

Although perhaps contradictory to the participants’ involvement in interdisciplinary education and descriptions of units combining various disciplines, Judy highlighted instances where some subjects should be taught in isolation from others. She identified the math curriculum as difficult to “force” into an interdisciplinary format, because “you can’t cover [the whole] math curriculum” if it is built into interdisciplinary units. Her main argument for having at least some isolated math instruction was the number of expectations teachers had to cover in each grade level. In addition to math, Judy explained that Physical Education (P.E.) was difficult to integrate into other subjects, although she acknowledged that the P.E. teacher at her school used inquiry and discovery based learning in lessons. A final example of disciplines that should be taught in isolation contradicted earlier comments about which subjects are typically combined. Judy stated that certain required elements of the language curriculum did not necessarily fit naturally with other disciplines. She highlighted that a key point for building units
was not having “four units that have procedural writing in them and no units with persuasive writing or vice versa.” This could exemplify the need to carefully consider specific strands and skills when designing interdisciplinary curriculum in order to avoid forming only inauthentic links between different disciplines (Applebee et al., 2007).

4.5 Educators Use A Variety Of Starting Points And Assessment Formats In Planning And Assessing Interdisciplinary Curriculum

To explain their practices in planning and assessing interdisciplinary curriculum, the participants named a variety of starting points for the planning process and explained the different types of assessment they used throughout interdisciplinary units. Understanding how educators plan and assess interdisciplinary curriculum provides resources on current successful practices in the implementation of interdisciplinary curriculum. Starting points included big ideas and external frameworks, but backwards design was emphasized as necessary for successful interdisciplinary units. Participants suggested that assessment take place throughout units, and a key part of assessing student learning was the incorporation of opportunities for student reflection and self-assessment.

4.5.1 Educators emphasized backward design and external frameworks as starting points for teachers to begin planning interdisciplinary units and lessons

Judy and Linda highlighted several strategies and resources for teachers to use as starting points for planning interdisciplinary curriculum. One kind of resource Linda emphasized was pre-written lesson and unit modules such as the PYP framework and Kath Murdoch’s (2010) inquiry cycle that teachers can use to guide a unit or series of lessons. A second starting point she
identified was starting the planning process by determining the summative assessment so that the unit has a focus and teachers can combine skills and content from different disciplines with their own goal in mind. After establishing the goal of a unit, teachers build the unit backwards to determine how to reach that goal. Finally, she suggested identifying the “big ideas” that students need to understand to determine a topic or theme for a unit. Using big ideas and a summative assessment, Linda explained, can fit into the PYP planner as key starting points for designing interdisciplinary curriculum. Existing research on strategies educators use to successfully implement interdisciplinary education discussed sufficient time, collaboration with colleagues, and administrative support (Alahiotis & Karatzia-Stavlioti, 2006; Barry & Schons, 2004; Frykholm & Glasson, 2005). While time, collaboration and support are frequently mentioned as strategies in existing literature, there are also mentions of material resources as part of the planning process that leads to successful implementation of interdisciplinary curriculum (Kieff & Bryant, 2005).

4.5.2 Educators use various types of diagnostic, formative, and summative assessments in assessing individual student learning in interdisciplinary units and lessons

In planning interdisciplinary curriculum, educators not only have to consider summative assessments, but the other forms of assessment as well and how these relate to the interdisciplinary nature of their lessons and units. Judy highlighted the importance of diagnostic assessment, not only so teachers know what students know at the beginning of a unit, but also so that students can reflect on their own growth and learning by the end of a unit in comparison to their initial assessment. The self-reflection students engage in is an expected component of units Judy teaches. She said she asks students how their “work on this unit changed the way [they]
think about” the topic at hand, and often the students recognize their own learning. Student self-assessment may not be unique to interdisciplinary learning, but was highlighted as important by an educator working to plan and teach interdisciplinary curriculum. Cunnington et al. (2014) found that employing interdisciplinary practices was related to growth in student reflections, as well as greater social engagement and development of socio-emotional skills, which may be why educators choose to incorporate this form of assessment in their classroom activities.

Another part of assessing interdisciplinary curriculum that Judy described were the ongoing and summative assessments throughout units, as teachers have to assess content and skills from different disciplines. Judy explained that multimodal presentations allow students to show their learning in a variety of ways and show how different disciplines connect. For example, the Grade 6 students’ exit projects are multimodal presentations, as students are expected to present orally, create a slideshow and a poster display of their work that demonstrates content knowledge in a variety of disciplines. In other situations, different media were used to demonstrate student learning at various points throughout a unit. For interdisciplinary projects, Judy clarified that teachers developed success criteria specific to the project that they then mark students by, depending on the skills students are developing from each discipline. In studies of academic outcomes, students frequently performed better on academic assessments following interdisciplinary intervention (An et al., 2013; Cunnington et al., 2014). However, in these studies there were no clear explanations of how assessments were planned and conducted. This finding contributes to a discussion of how teachers can conduct assessment of student learning in interdisciplinary contexts as well as how interdisciplinary contexts can provide opportunity for diversity of assessments.
4.6 Conclusion

This chapter reviewed the findings from interviews with two participants on their beliefs about and practices of interdisciplinary education at the elementary level. In looking at how educators successfully plan and implement interdisciplinary education, a key finding that emerged in this chapter was the use of external frameworks to plan interdisciplinary curriculum. Educators drew on curriculum documents, the PYP framework and used starting points like identifying big ideas and backwards design to assist in planning interdisciplinary units. Another important finding that emerged in this study was the need for collaboration between teachers when planning an interdisciplinary curriculum, which supports suggestions from existing literature on successful implementation of interdisciplinary curriculum. Challenges that educators faced in developing interdisciplinary curriculum included lack of planning and collaboration time, teachers’ lack of confidence, as well as limits imposed by institutional frameworks. Investigating practices educators use and challenges they face in planning and implementing interdisciplinary education confirms challenges highlighted in existing literature as well as identifies strategies that educators use to provide students with an interdisciplinary education. Specifically, educators interested in interdisciplinary education can draw from successful practices identified by participants. Implications and recommendations from these findings, as well as opportunities for further research, will be discussed in Chapter 5 below.
Chapter 5: Discussion

5.0 Introduction

In this chapter I discuss the implications of my research study and consequent recommendations. I begin by reviewing the key findings of what educators do to successfully plan and implement interdisciplinary curriculum. Then, I discuss the implications of these findings for the educational community and myself as a teacher and researcher. I also make recommendations for various stakeholders in education including school administration, teachers, and teacher education programs. Following this I identify several potential avenues for further research and then conclude by summarizing my findings.

5.1 Overview Of Key Findings

Five key findings emerged from this research study and are outlined below. Each key point addresses one subsidiary research question that also pertains to the overall research question of this study. One key finding of this research study was that educators defined interdisciplinary education as a combination of teacher practice and skill development. This means students’ interdisciplinary learning experiences arise out of teachers’ intentional planning and guidance, as well as the teacher’s understanding of what interdisciplinary education is. Both participants stated that practice of interdisciplinary education often includes inquiry-based learning for students as well as approaching real-world problems in the classroom. They also highlighted the value of interdisciplinary education in its ability to provide students with skills for the future that would be developed through accessing content.

Another key finding is that educators working with interdisciplinary curricula identified resources like curriculum frameworks and books for students as important for developing skill
and interest in interdisciplinary education. This finding speaks to specific strategies that educators use to successfully implement interdisciplinary education in their schools. Collaboration with colleagues was an important part of the planning process in both participants’ schools. Another resource participants identified were external frameworks and material resources like books that could support teachers in developing an interdisciplinary curriculum. A final resource Linda mentioned was the value of reflection in her own teaching practice, and that certain ways of thinking are more conducive to developing interdisciplinary curriculum.

A third key point from this research is that educators identified individual and institutional challenges to successful planning and implementation of an interdisciplinary curriculum. Both participants emphasized the need for time to collaborate and plan a successful interdisciplinary curriculum, and stated that this was often difficult to come by. This finding aligns with existing research on challenges to implementing interdisciplinary education (Barry & Schons, 2004; Brand & Triplett, 2012). Another challenge participants identified is that teachers’ lack of confidence may limit their risk taking if they are unfamiliar with interdisciplinary approaches to education. Judy also identified institutional challenges like conflicting mandates of the Ministry of Education and the Primary Years Programme limit freedom teachers have to develop their curriculum.

Educators also identified different subjects and expectations that could be integrated and combined or that they thought should be taught in isolation. This finding again speaks to strategies teachers use to develop an interdisciplinary curriculum. Both participants identified language and visual arts as subjects frequently integrated into other subject areas, but also emphasized that subject combinations should arise from expectations that naturally fit together. Linda clarified that entire disciplines do not combine, but rather specific topics within various
disciplines can be explored simultaneously. In addition to specific examples of which topics were frequently combined, Judy noted that certain subjects or expectations should be taught in isolation because full integration is unrealistic and some topics required students’ time and focus.

A final finding of this research study was that educators use a variety of starting points and assessment formats in planning and assessing interdisciplinary curriculum. Backwards design and external frameworks like the PYP framework were cited as starting points for planning an interdisciplinary curriculum. Regarding assessment of interdisciplinary learning, Judy spoke of the importance of formative assessment both for teachers and for students’ reflections on their learning. Judy also gave examples of ongoing assessment of different subjects in the context of a larger project. Teachers develop success criteria specific to the task at hand that allows them to assess student success in relation to expectations for each academic discipline.

5.2 Implications

This section explores implications of my findings for both the wider educational community and my self as a teacher-researcher.

5.2.1 Implications for the educational community

My findings identify several key points that members of the educational community can draw from when considering the implementation of interdisciplinary education at the elementary level. First, while existing literature is limited in identifying specific strategies for how teachers can successfully plan and implement interdisciplinary education, participants show that it is possible with various supports in place. They also highlight the advantages of interdisciplinary
education for students, namely that it encourages the development of skills for the future. If teachers and administrators recognize that successful interdisciplinary education is beneficial and attainable, they may be more likely to attempt to implement it in their own schools. A potential caveat to this, however, is that participants also recommended certain subjects be taught in isolation in order for students to fully understand certain topics. In particular, math was recognized as a subject that should not necessarily be fully integrated with other disciplines, and consequently, educators should perhaps consider the balance of interdisciplinary and non-interdisciplinary content in their curriculum.

A second implication of my findings for the educational community speaks to the specific strategies educators can use to support their development and practice of interdisciplinary education. Collaboration is a key part of successfully planning and implementing interdisciplinary education. Both participants stated that collaborating with colleagues was necessary to the planning process, and that it allowed teachers to draw on each other’s strengths.

A final key implication identifies another resource educators can use to aid the process of planning successful interdisciplinary curriculum. There are external frameworks that educators can use to support the planning process. For example, both participants identified the Primary Years Programme as a starting point and guide in planning interdisciplinary units and lessons. Teachers and administration should be aware that there are existing resources to support interdisciplinary practice, and that despite common challenges facing teachers trying to implement interdisciplinary education, supports are available to help teachers succeed.
5.2.2 Implications for myself as a teacher-researcher

In conducting this research I have learned more about what interdisciplinary education looks like in elementary schools and how I can support my own teaching practice, but also more about my goals as a teacher. One implication of these findings for myself is that my personal beliefs about education align with the intentions and goals of interdisciplinary education. Interdisciplinary education aims to provide students with contextual learning experiences that develop their skills and their ability to apply skills to new situations. However, in talking to my participants and analyzing the interview findings, I now realize that perhaps not all learning should be interdisciplinary. Some concepts and skills can be learned in isolation from other subjects in order to help students reach high levels of proficiency in that skill. In instances where an interdisciplinary approach is appropriate, I also recognize that supportive environments aid the successful planning and implementation of interdisciplinary curriculum, and that I should seek out such environments to learn from and work in. These implications primarily relate to my practice as a teacher, although there are also implications for my research practice. As a researcher seeking to understand educational practices, I carry forth the understanding of how I ask questions to learn from other educators, and how I can use what I learn to inform my teaching practice.

5.3 Recommendations

In this section I make recommendations for various stakeholders in education likely to have a particular interest in and power to implement interdisciplinary education. Making recommendations as a result of having conducted this research can bring about change in schools in order to provide or improve provision of interdisciplinary education to students. The groups I
make recommendations to include: teacher education programs, school administrators, and classroom teachers.

5.3.1 Recommendations for teacher education programs

A recommendation arising from this research for teacher education programs is to explicitly educate preservice teachers on the development of interdisciplinary curriculum. Both participants identified a lack of practical explicit preparation for planning and implementing interdisciplinary education in teacher education programs. Judy explained, “teachers are not trained to teach” with an interdisciplinary approach, so a step towards supporting this practice would be to educate teachers to do so.

5.3.2 Recommendations for school administration

Both participants worked in schools with a school-wide practice of interdisciplinary education. If administrators are interested in encouraging interdisciplinary practices in their schools and amongst teachers, they should make time for teachers to meet and collaborate on developing interdisciplinary curriculum. Lunchtime or after-school meetings are insufficient for teachers to genuinely collaborate, and the scheduling conflicts with specialist teachers makes genuine interdisciplinary planning difficult. One suggestion could be to release teachers for half or full school days to allow them to spend sufficient time planning interdisciplinary units.

5.3.3 Recommendations for teachers

A recommendation for teachers aiming to make their classroom learning interdisciplinary is to actively seek out other educators to learn from and collaborate with. Collaboration was
highlighted as a crucial part of planning successful interdisciplinary curriculum. Teachers can draw from specialist subject teachers and build connections between different disciplines. Working with other teachers in that grade can draw from different experiences with a particular age group and units that the teachers are familiar with. Finally, working with teachers of other grade levels could build connections and community in the school in addition to helping develop interdisciplinary units and lessons.

A second recommendation for teachers aiming to develop interdisciplinary curricula is to combine and bridge topics that naturally fit together, rather than grouping whole disciplines or forcing different ideas together. An example given was the combination of ‘Strong and Stable Structures’ with report writing in Grade 3. When planning, Linda recommended looking for topics that naturally fit together in order to create an interdisciplinary plan.

5.4 Areas For Future Research

While existing literature on interdisciplinary education focuses on the benefits of and challenges to successful interdisciplinary education, the findings in this paper suggest several avenues for further investigation. Both participants identified the need for teachers to collaborate to successfully plan an interdisciplinary curriculum. Exploring how different schools and contexts facilitate collaboration between teachers could provide teachers and administrators with specific strategies to use when planning interdisciplinary curriculum. For example, Judy’s school would use release time to make time for teachers to plan, but she did not explain exactly how teachers communicate or how meetings progress in developing an interdisciplinary curriculum.

Both participants also mentioned external frameworks as a support to the planning process. Another area of research could investigate which external frameworks schools in
Ontario use and how they are used in the planning and implementation process, as well as whether these frameworks are relevant in a variety of contexts.

A perspective missing from this research is the practices of educators implementing an interdisciplinary curriculum without school-wide support. Both Linda and Judy work at schools that have already adopted an interdisciplinary approach. Resources, administrative support, and collaboration are beneficial to delivering a successful interdisciplinary curriculum (Barry & Schons, 2004; Carrier et al., 2011; Orillion, 2009). Teachers working to deliver such a curriculum independently likely do not have these supports readily available, and understanding how and why these teachers take an interdisciplinary approach could support other teachers in similar positions.

Finally, this study focused on the planning and implementation processes related to interdisciplinary education, but did not explore how teachers reflect on and revise their curriculum. Studying the progression of an interdisciplinary curriculum provides insight into the teachers’ learning processes and perhaps aid in identifying how teacher development programs can support preservice teachers as they endeavor to adopt an interdisciplinary approach to education.

5.5 Concluding Comments

In this chapter, I gave an overview of the key findings of my research study, and then explained some of the implications and recommendations arising out of the study before suggesting several avenues for further research on the topic of interdisciplinary education practices at the elementary level. The participants in this research study highlighted challenges to successfully implementing interdisciplinary education at their schools, but also identified several
strategies that teachers can adopt in their approach to interdisciplinary education. Conducting this research has provided me with strategies and supports to look for in future teaching and learning environments, as well as justification for why and how to implement interdisciplinary education for elementary students. In applying strategies like using external frameworks and collaborating with other educators, I am taking an approach to interdisciplinary education that is more than just lesson planning and making superficial connections between subjects, but considers interdisciplinary education a mindset that educators can have. This study aims to highlight practices teachers can adopt to support the development of such a mindset.
References


Appendix A: LETTER OF CONSENT

Date:

Dear ______________________________,

My Name is Anna Gerke and I am a student in the Master of Teaching program at the Ontario Institute for Studies in Education at the University of Toronto (OISE/UT). A component of this degree program involves conducting a small-scale qualitative research study. My research will focus on how elementary teachers plan and implement interdisciplinary lessons, and what outcomes they observe from students. I am interested in interviewing elementary teachers who have demonstrated commitment to interdisciplinary teaching. I think that your knowledge and experience will provide insights into this topic.

Your participation in this research will involve one 45-60 minute interview, which will be transcribed and audio-recorded. I would be grateful if you would allow me to interview you at a place and time convenient for you, outside of school time. The contents of this interview will be used for my research project, which will include a final paper, as well as informal presentations to my classmates. I may also present my research findings via conference presentations and/or through publication. You will be assigned a pseudonym to maintain your anonymity and I will not use your name or any other content that might identify you in my written work, oral presentations, or publications. This information will remain confidential. Any information that identifies your school or students will also be excluded. The interview data will be stored on my password-protected computer and the only person who will have access to the research data will be my course instructor Dr. Angela MacDonald-Vemic. You are free to change your mind about your participation at any time, and to withdraw even after you have consented to participate. You may also choose to decline to answer any specific question during the interview. I will destroy the audio recording after the paper has been presented and/or published, which may take up to a maximum of five years after the data has been collected. There are no known risks to participation, and I will share a copy of the transcript with you shortly after the interview to ensure accuracy.

Please sign this consent form if you agree to be interviewed. The second copy is for your records. I am very grateful for your participation.

Sincerely,

Anna Gerke
anna.gerke@mail.utoronto.ca
Consent Form
I acknowledge that the topic of this interview has been explained to me and that any questions that I have asked have been answered to my satisfaction. I understand that I can withdraw from this research study at any time without penalty.

I have read the letter provided to me by Anna Gerke and agree to participate in an interview for the purposes described. I agree to have the interview audio-recorded.

Signature: ________________________________________

Name: (printed) ______________________________________________

Date: ______________________________________
Appendix B: INTERVIEW PROTOCOL

Section A – Background Information

1. Can you tell me about your background in education?
   a. How long have you been teaching?
   b. What is your current position? Who do you work with? How long have you been in this position?
   c. What other teaching positions have you held?

2. Can you tell me about your current school? (e.g. size, demographics, program priorities)
   a. How long have you been teaching at this school?

3. What is your interest in and background with interdisciplinary teaching/education?
   a. What personal, educational, and professional experiences contributed to developing your interest in, and preparation for, interdisciplinary teaching? (e.g. K-12 schooling experience, University studies, course work, teachers college, practicum experiences, professional development)
   b. How long have you been teaching like this?

Section B – Perspectives on Interdisciplinary Teaching

4. What does inter-disciplinary teaching mean to you?
   a. What are some of the defining characteristics of this approach to teaching?
   b. How do you understand the meaning of an interdisciplinary curriculum?

5. Why do you believe that is important to teach an interdisciplinary curriculum?
   a. In your view, what are some of the benefits that result from this approach to teaching?
b. What, if any, are the limitations of this approach?

6. In your experience, is it common for teachers to implement an inter-disciplinary curriculum? Why / why not?

Section C – Interdisciplinary Teaching Practices

7. What does inter-disciplinary curriculum look like in your classroom?

   a. What subjects do you typically combine and why?

   b. If I were to spend a day in your classroom, what kinds of lessons would I observe? Can you provide me some examples of interdisciplinary lessons that you have taught?

      i. What were your learning goals?

      ii. What opportunities for learning did you create?

      iii. What resources were used?

      iv. How did students respond to these lessons? What outcomes of learning did you observe?

   c. How do your students typically respond to this approach to learning?

      i. What, if any, academic outcomes have you observed?

      ii. What, if any, social outcomes have you observed?

   d. What are some key considerations that you make when planning inter-disciplinary lessons? What does the planning process look like and involve?

   e. What are some key considerations that you make when assessing inter-disciplinary lessons and when designing tools for assessment and evaluation?
8. What role, if any, does collaboration with other teachers play in the planning and implementation processes?

   a. How does this collaboration take place? What does it look like?

Section C – Supports and Challenges

9. What supports are present in the school for creating interdisciplinary lessons?

   a. How, if at all, has this changed over time? (if applicable)
   
   b. What key factors and resources support you in designing and implementing interdisciplinary lessons? (e.g. whole school commitment, supportive admin and colleagues, collaborative learning environment, access to technology and material resources, websites, videos, books etc.)

10. What challenges do you face in implementing interdisciplinary education?

    a. How do you respond to the challenges you face?
    
    b. What range of supports would further assist you in meeting these challenges?

Section D - Closing

11. What advice or suggestions do you have for other teachers hoping to plan and implement interdisciplinary practices in their class?

12. Do you have any further comments that you would like to make in relation to this topic?

Thank you for your participation.