

The Human Nature of Chemistry Curriculum Design and Development:

A Canadian Case Study

by

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### **Abstract**

This thesis is a case study of the design and development of one Canadian province's intended Grade 12 curriculum. It explores the story associated with its design and development and the lived experiences of the stakeholders involved. As Pinar et al. (1995) asserted, "[Curriculum] is intensely historical, political, racial, gendered, phenomenological, autobiographical, aesthetic, theological, and international." (p. 847). That is, the curriculum is a snapshot of the influences, and potentially competing influences, during a time period. Because it is a human construct, it ultimately displays in its text a medley of ideas, values, and beliefs that represent the orientations of those involved. Specifically, the research in this study identifies several of the dimensions of the nature of curriculum development considered by Pinar et al. (1995), namely: the "historical, political, ... phenomenological, [and] autobiographical" (p. 847). The curriculum product provides indication of a "marble cake" (Bell, Carr, & Jones, 1995, p. 99) representing stakeholder influences that are evident within the content of the pages within the curriculum document. Because of these influences, "Students and teachers are entitled to a fuller explanation of the curriculum developers' knowing stance and interest" (Aoki, 1978, p. 414). In response to Aoki's call, this thesis seeks to reveal the "fuller explanation" (Aoki, 1978, p. 414) behind the construction of the intended Chemistry curriculum document. The goal is to highlight the dynamic human nature of the curriculum construction process. This research determined the factors that influenced it and the lived experiences of the stakeholders involved. It examined how they reflected on the curriculum process and curriculum product, and investigated the deconstruction/reconstruction processes experienced by some participants. Themes were drawn from document analyses and participant interviews. Data was drawn from eight out the fifteen possible participants that were directly involved in the curriculum development process. The foundations of curriculum of Ornstein and Hunkins (2009) and Eisner's (1979) orientations of

curriculum were used as the theoretical frameworks to analyze data from the document analysis and interviews. The study concluded that twelve factors influenced this curriculum development project. It also identified a spectrum of tensions and experiences that help to explain these influences. The study revealed the tensions and missed opportunities participants perceived were associated with the process, and described how some stakeholders reconstructed notions about the nature and purpose of chemistry education as a result of their participation in the process. This research helps educators in provinces involved in curriculum development to make more informed decisions about designing, developing and implementing curriculum. It provides further understanding of the human factors involved when developing new curricula. The framework of this thesis can be used as a model to understand the design and development of any curriculum. This research argues for further research that examines similar influences on curriculum and how the experience of curriculum construction can be understood through the viewpoints of those developing, working with, or eventually affected by curriculum.

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## Chapter One: Introduction

### 1.1 Introduction

This thesis explores the development of one Canadian province's Chemistry curriculum document, to be referred in this thesis as the *Provincial Grade 12 Chemistry Curriculum Framework* (2013). The thesis studies the story associated with its development and the lived experiences of those associated with its development. As Pinar et al. (1995) asserted, “[Curriculum] is what the older generation chooses to tell the younger generation. [It] is intensely historical, political, racial, gendered, phenomenological, autobiographical, aesthetic, theological, and international. It becomes the site on which the generations struggle to define themselves and the world” (p. 847). This comment by Pinar et al. provides the foundation for this investigation. The curriculum is a snapshot of the influences, and potentially competing influences, during a time period. It is a human construct. It is a medley of ideas, values, and beliefs that give indication of a web of inter-relations. It becomes a piece of history that defines what students learn in school. Because curriculum is a human construct, it is influenced by stakeholders and context. Because of this influence, “Students and teachers are entitled to a fuller explanation of the curriculum developers’ knowing stance and interest” (Aoki, 1978, p. 414). In response to Aoki’s call, this thesis seeks to reveal the “fuller explanation” (Aoki, 1978, p. 414) behind the construction of the *Provincial Grade 12 Chemistry Curriculum Framework* (2013) curriculum document. The goal is to highlight the dynamic human nature behind the construction of what I originally thought of as a static document sent from the powers above. In terms of the *Provincial Grade 12 Chemistry Curriculum Framework* (2013) curriculum document, this research investigates the factors that influenced it, the lived experiences of the stakeholders involved, and the deconstruction/reconstruction processes experienced of the participants.

Curriculum can be a simple or complex notion. Aoki (2005) simplifies curriculum into two main types (that are complex within themselves): “curriculum-as-plan [and] curriculum-as-lived-experiences” (p. 159). One notion this thesis claims, ‘curriculum construction as curriculum,’ notes that the curriculum construction process is indeed a curriculum in itself. The curriculum in the context of a classroom setting can be compared to the curriculum design and development process. Just as teachers have a “curriculum-as-plan” (Aoki, 2005, p. 159) in their classrooms, that is, what they intend to teach, the curriculum stakeholders also have a “curriculum-as-plan” (Aoki, 2005, p. 159), that is, what they seek to see manifest in the curriculum document. Second, students and teachers have a “curriculum-as-lived-experiences” (Aoki, 2005, p. 159), that is, what actually happens when the curriculum is implemented. It includes all the experiences brought to, and created in the classroom. This can be compared to the actual construction of a curriculum. The stakeholders bring their experiences and create new ones in the journey of designing and developing the new curriculum. This thesis explores how the curriculum construction process in itself is a curriculum. Furthermore, the curriculum construction process is not an intentional “plan for learning” (Wiles & Bondi, 1984, p. 3) for the stakeholders. Curriculum leaders typically do not set learning outcomes for what the stakeholders should learn from participating in curriculum construction, but, rather, the stakeholders’ learning comes out of their lived experiences during the process. Stakeholders experience the curriculum construction process as “currere” (Pinar & Reynolds, 1992, p. 32). Their “currere...describes the race not only in terms of the course...but also...the experience of the running of one particular runner” (Pinar & Reynolds, 1992, p. 32). Pinar and Reynolds (1992) are talking about the curriculum, but in this case I am applying it to the curriculum construction process.

The written/formal curriculum document often is perceived to be a “marble cake” (Bell, Carr, & Jones, 1995, p. 99) of different curricular foundations (Ornstein & Hunkins, 2009) and orientations (Eisner, 1979). That is, there is a complex mixture of foundations and orientations that bleed into each other. They swirl back and forth in the text, but retain their flavour. One can pick out different entities within the whole, but these entities swirl together to make one unit, but each entity remains evident in the textual product or unit. This unit is the final written/formal curriculum document. This “marble cake” (Bell, Carr, & Jones, 1995, p. 99) is manifested by the different voices that come through in the document. This brings up many questions for me, as a teacher implementing curricula. What influences predominate? What allows them to predominate? What were the events that led to this predominance? Everything from the language used to how the document is physically bound provides evidence to determine where the more predominant influences originated. That is, the personalities, philosophies, values, and experiences of the stakeholders are represented in different ways in the curriculum document, whether intended to or not. This investigation seeks to bring forth explanations of the smells and tastes evident in the *Provincial Grade 12 Chemistry Curriculum Framework* (2013) curriculum document. That is, what were the stakeholders’ “knowing stance[s] and interest[s]” (Aoki, 1978, p. 414) behind the contents of the curriculum?

## **1.2 Positionality and Inspiration for the Study**

It is appropriate to begin this thesis by locating myself within this research and explaining the rationale for exploring the topic mentioned in the previous section. I am a white, middle-class male working at an independent, faith-based school in an urban setting. I teach mainly chemistry in high school, both at the Grade 11 and 12 levels. I did not participate in the design and development of the Grade 11 or Grade 12 curriculum during its development process in 2003

and 2004, although I was aware that the curricula were under development because of my introduction to sections of the curriculum through my pre-service teacher education and, upon graduation, as a participant in the professional development associated with the curriculum's release. As a teacher, I have worked with the draft Grade 11 curriculum since its release as a draft document in 2004 and its formal release in 2006. I have also worked with a short, unedited draft version of the 2004 Grade 12 curriculum, which has, rather oddly, been formally released recently in 2013. I recall the day, in June 2013, when the formal Grade 12 curriculum was released. With the usual morning trip to my school mailbox, a letter from Provincial Education was poking out from under my attendance book. The first paragraph read "We are pleased to announce the new Grade 12 Chemistry curriculum" (Provincial Education, 2013). I was shocked that this document had been released, so long after the release of the draft document. After all, I had been working my entire teaching career with the unedited draft version since 2006 (the draft document released online in fall 2004)! I knew that new curriculum documents often took a while to release, but over nine years seemed absurd. Although many people were involved in the design and development process, nine years seemed like a really long time. At the time I received this letter, I had recently completed my course work in the thesis-based Master of Education at the University of Manitoba focusing in curriculum studies in the Department of Curriculum, Teaching, and Learning in the Faculty of Education. I spent the last year studying historical and contemporary approaches to curriculum, its design and development, and educational research approaches. After learning about some of the processes involved in constructing curriculum, I thought about the events that would have happened during the construction of the new Grade 12 Chemistry curriculum over this nine year time period. I realized that this new curriculum document is a living piece of history. It is a snapshot in time of

a group of peoples' values, experiences, ideologies, beliefs, and feelings about the world and how it pertains to chemistry. It is a human creation, with its own unique tone and personality. There is no other document like it. Even if one of the stakeholders involved was swapped for someone else, the document would, potentially, be a different creation, with a different tone and personality.

With the realization of the 'power' of the document and its importance, I wondered why it took so long to be released. It seems to me that something out of the ordinary must have happened. Was it because the development team could not get together often enough? Was it because of cut backs in funding? Was it because of major disagreements in the content of the document? Or, was I reading too much into this delay? Were the reasons less innocuous? As I looked at the Grade 12 document I also quickly realized that the content of the curriculum and, in particular, the chemistry it represented was quite different from the Grade 11 curriculum. This further brought into question the processes associated with the curriculum's development. I could see that the curriculum had a much more mathematical focus as opposed to the, soon-to-be-described, 'balanced' nature of the Grade 11 curriculum. It was obviously a much more academically difficult curriculum. It was at this time that I received the letter and began to look at the content of the curriculum that I decided I would find out what happened in the development of the document. I wanted to explore the human nature – the humanity – of the curriculum process.

The curriculum construction process is itself a curriculum, as stakeholders must learn as they work through the curriculum construction process. The stakeholders experience the curriculum construction process as "currere" (Pinar & Reynolds, 1992, p. 32). That is, the process itself was a lived experience for the people involved. The process of developing this

curriculum was a journey. Perhaps the stakeholders' own philosophy of teaching was questioned, or forced to be re-worked in the construction of the curriculum. They would have had to ask themselves many questions: why do they teach chemistry the way they do? What should students be taught for the next decade or so? What foundations is the curriculum going to be built upon?

I could not get over the fact that my Grade 12 Chemistry course was, upon observation, so difficult, especially in comparison to the Grade 11 curriculum. This was a major struggle for me. Had I been doing my job properly? Was I teaching chemistry the way the curriculum document intended? If I was experiencing tensions with this curriculum in terms of what I was currently enacting and now what was intended, were there tensions experienced by those involved in this curriculum's design and development – especially if some of the same people were involved with both the development of the Grade 11 *and* Grade 12 curriculum?

It is my position, that people have values, which determine how and what they consider important in chemistry. Their vision for the intended and implemented curricula is dependent on many factors. The intended curriculum refers to what the teacher sets out to teach, and the implemented curriculum is what the curriculum actually turns out to be in real life. Who teachers are as people comes out in their teaching, relationships with students, and essentially in every aspect of their practice. The factors that motivate teachers as people are revealed in various ways. Teachers may be excited about teaching chemistry based on their own values, possibly only to have those values minimized or snuffed out by real world factors that influence teaching. I have experienced this in my own teaching, which sparked the interest for this inquiry. I want to investigate what the stakeholders' views were before starting the curriculum construction process and what they were coming out of the process. Did their views change? Did they have to deconstruct any current views and reconstruct new ones?

### **1.3 Focus of Research and Purpose**

This research is a case study of the human dynamics involved in the construction of the *Provincial Grade 12 Chemistry Curriculum Framework (2013)* curriculum document.

The over-arching general research question is:

**What were the human dynamics involved in the design and development of the *Provincial Grade 12 Chemistry Curriculum Framework (2013)* written/formal curriculum document?**

This study looks at the interpersonal intricacies involved in the curriculum construction process. The curriculum is human in nature. It is a single composition riddled with varying perspectives from many different people. It is a uniquely dynamic document with many events and ideas that influenced the stakeholders.

This leads to the first specific research question:

**(1) What were the main factors that influenced the construction of the *Provincial Grade 12 Chemistry Curriculum Framework (2013)* written/formal curriculum document?**

This case study examines the range of influences that permeate the pages of this curriculum document. There are influences that meld together and form a guidebook for what the province's chemistry students should learn. This research does not reveal all influences involved in a curriculum process, but focuses on one case study which reveals the influences faced by a unique group of stakeholders that came together to create a particular curriculum document.

These influences come from a variety of places within the stakeholders themselves, and also through experiences they have had. Although each participant was working toward the same end goal, constructing a new curriculum, each experienced the process in different ways. This

can be compared to a classroom setting, where each student brings their own story to make sense of the day's lesson. Each student brings their own heritage, values, experiences, and attitudes to experience a certain phenomenon.

This leads to the second research question:

**(2) What were the lived experiences of the stakeholders involved in the construction process from conceptualization through to implementation?**

Each committee member was a part of the same process, but could have experienced it in different ways. This research reveals the experiences the members had as they went through the process. This is the phenomenological part of the study.

The participants gathered a collection of new experiences by participating in the curriculum construction process. They took their past experiences and brought them to the table. These ultimately influenced the process. By working as a development team, the members then gained new experiences. Perhaps they opened up to new or different ways of thinking.

This leads to the third and fourth research questions:

**(3) In retrospect, how do the stakeholders look back at the process and the product?**

**(4) What is the nature of any deconstruction and/or reconstruction processes the stakeholders experienced?**

That is, this thesis seeks to describe how stakeholders reflect on the process as a whole. Furthermore, do team members deconstruct any notions about teaching chemistry? Do they construct new informed ideas? If so, what is the nature of this process? If members talk about opening themselves up to new points of view, this provides further insight into the "currere" (Pinar & Reynolds, 1992, p. 32) that the participants experienced. That is, what curricular

foundations/orientations did the participant prefer before the process, and did they change as a result?

In general, the purpose of this phenomenological case study is to understand the human nature of the curriculum development team members of the *Provincial Grade 12 Chemistry Curriculum Framework (2013)* curriculum. For this thesis, human nature is generally defined as the human interactions that influenced the curriculum's construction.

Specifically, the purpose of this research is: (1) to record the recollections of the stakeholders' experiences during the process; (2) to analyze these reflections in terms of the factors that influenced their ideologies and whether they experienced processes of deconstruction/reconstruction in their view of chemistry education; (3) to document and report the themes in terms of the influences on curriculum, the team members' experiences, and any tensions that led to deconstruction/reconstruction; (4) to collect and synthesize the influences on the Chemistry curriculum, and the nature of any processes of deconstruction/reconstruction; (5) to inform further research that investigates people affected *by* curriculum: not the stakeholders themselves, but rather the people who are directly affected by the implementation of the document (for example: teachers, students, parents, and businesses).

#### **1.4 Significance of Study**

The significance of this study goes back to the realization of the intensely complex nature of curriculum construction. Teachers often focus on what and how they teach, but do not ask *why* they teach the way that they do. The foundations/orientations of an intended curriculum reveal the answer to this question. This is significant to inform teachers why they teach what they teach. This helps teachers adapt the over-arching curriculum to their own context. Schiro (2008) adds to this idea by saying that, "When educators understand their own conceptual frameworks and the

range of ideological options available to them, it can help them to more effectively clarify and accomplish their own curriculum and instructional goals” (p. 9).

The study is also significant because it brings forth the story behind a specific curriculum. It reveals the influences involved in its design and development. This is important for possibly guiding future curriculum developments. With defining some of the major influences involved, it attempts to reveal some of the intentions behind the make-up of the document. This can inform chemistry teachers of any province as to how to implement the curriculum in their own contexts. Because this is a qualitative study, there are no generalizations that can be made beyond the boundaries of the case itself, but all chemistry teachers in this certain province interact with this document, so they can use this information to better guide them in their curriculum implementation. If teachers are aware of the intentions behind the document, they may be able to better understand its meaning.

The significance of revealing the lived experiences of the participants during the construction process is likely to manifest curriculum’s phenomenological nature. Each participant brings every aspect of their lives into the process. Some examples include what works for them in their teaching, their chemistry-specific education, political views, philosophies of teaching, and views of learning. With the many factors involved, and many experiences that not only the team members brought forth to the process, but also created during the process, this research also reveals the positive and negative factors involved. Revealing these aspects can help give some idea of the things people face when involved in the curriculum construction process.

With revealing the lived experiences, and thus the tensions involved, exploring the nature of any deconstruction/reconstruction processes involved is also significant. Deconstruction processes being: did the team members have to critically examine themselves? Did they have to

open up to new ways of thinking about chemistry education? That seems to be why a new curriculum is created in the first place, because the older one is not working anymore. Would not the members have to take apart and analyze their current notions of chemistry education? If so, what was the nature of this opening up? What did it involve? Exploring the nature of these processes, if they exist at all, is significant in further understanding the complex nature of curriculum construction. Shiro (2008) takes this further by saying simply that people can work better together if they can understand the *possible* views that someone can have, even if they are not expressed. Shiro states that, “When educators have perspective on and understand the range of philosophical beliefs that colleagues can hold, this can enable them to better understand the nature of curriculum disagreements...be more accepting of others, and more effectively work with people of differing opinions” (2008, p. 9).

The main significance of this study is simple: it is important to understand how we come to determine what students should learn in school as represented by the intended curriculum. By bringing to light many factors, experiences, and processes influencing the construction of an intended curriculum, hopefully we can be mindful of a more informed way to develop new curricula.

### **1.5 Limitations of Study**

The information gathered from this study is limited to the development of the most current (2013) chemistry education in this certain province. The qualitative data does not seek to generalize or define a cause and effect relationship. Because of the number of teachers obliged to work from this document, it is important to make known the intentions behind it.

A major limitation of this study is it is one case study of one curriculum construction process. The data revealed in this inquiry can only be attributed to what happened in the context

of the release of the *Provincial Grade 12 Chemistry Curriculum Framework* (2013) document. Generalizations cannot be made to other curriculum processes or documents.

Another limitation is that I interviewed people who recalled experiences from many years ago and over a long time period. The curriculum process started in 2003 and the final document was released in 2013. The people involved may have forgotten details they would have wished to bring forth. Furthermore, emotions they experienced during the process may have been diminished due to the time passed. This affects the results of the lived experiences to address research question number two. It would have been ideal to research the people as a longitudinal study during and after the process. Then the events that happened during the process could have been better compared and contrasted. The post-reflection nature of this study is a definite drawback.

A third limitation is that all the people involved in the process were not interviewed. This contributes to an incomplete account of the events that happened throughout the process. There were many people involved with differing degrees of involvement. Data that represents a smaller portion of the whole has gaps and omits explanations that would otherwise come forth. Some stakeholder perspectives are quite unique, and if those are not represented in the big picture, it narrows the study's comprehensiveness.

Lastly, an important limitation is that the participants know this study was to one day become a public document. For this reason, they may have left out essential information that contributes to the understanding of the humanity of curriculum processes this thesis seeks to explore. Reasons for this can include avoiding jeopardizing their own professional positions and/or the positions of others and maintaining positive collegial relationships. This thesis explores a curriculum process that is intensely human. As with anything where human nature

plays a significant role, there are aspects people typically would have done differently, if given a second chance. This can create feelings of embarrassment and humiliation. Revealing certain information as a stakeholder can uncover these feelings, and be reason alone to keep certain comments silenced, or not to participate at all.

### **1.6 Structure of Thesis**

The structure of this thesis is as follows. Chapter One gives an introduction where the focus of the study was presented. I located myself in the study by discussing my positionality and also provided a personal reflection of how I came to the focus of the study. This research questions and purpose were defined and also the significance and limitations of the study were explained.

Chapter Two, that follows, reviews the literature about curriculum processes and the human aspects involved. It unpacks the terms mentioned above and highlights the ideas of various curriculum theorists that deal with the human side of curriculum studies. It starts off by defining curriculum and discussing various types of curriculum. It then discusses what human characteristics are involved in curriculum. Furthermore, it organizes and explains the different foundations and orientations to curriculum. Next, this section looks at the literature about what is involved in the design and development of a curriculum. Finally, it discusses how stakeholders and context influence the curriculum construction process.

Chapter Three sets out the methodology for the study. It defines the research questions, the philosophical assumptions and interpretive framework. It then explains the context of the study, data sources, participants, research design, data collection, data analysis, ethical considerations, validity, limitations, and timeline.

Chapter Four is mainly a section of data collection. It describes the organization of the Chemistry curriculum, the general curriculum development process, and outlines the specifics of the case study.

Chapter Five is the data analysis section. It provides a document analysis and presents and analyzes interview data. With these multiple data sources, themes emerge which address the research questions.

Chapter Six gives an overview of the results with discussion. This chapter examines the analysis closely and identifies clearly the answers to the research questions. It also explores the implications for this research.

Chapter Seven draws final conclusions about the study and discusses suggestions for further study.

The latter part of the thesis consists of references and appendices.

## Chapter Two: Literature Review

### 2.1 Introduction

This chapter reviews the literature that focusses on the curriculum construction process, emphasizing the personal influence of stakeholders in the construction. A spectrum of human relations weaves throughout each stage of the process. As mentioned by Pinar et al. (1995), “[Curriculum] is what the older generation chooses to tell the younger generation. [It] is intensely historical, political, racial, gendered, phenomenological, autobiographical, aesthetic, theological, and international. It becomes the site on which the generations struggle to define themselves and the world” (p. 847). Further, as previously stated, Aoki (1978) claims that, “Students and teachers are entitled to a fuller explanation of the curriculum developers’ knowing stance and interest” (p. 414). By using the quotes by Pinar et al. and Aoki in Chapter One as a foundation for this thesis, the literature chosen now deals with aspects of human relations involved in curriculum construction.

The literature review begins by examining the many definitions of curriculum and focusses on the type of curriculum most prominent in this study: the written/formal/intended curriculum. By outlining a general definition of curriculum, the perspective then shifts to the idea that curriculum is a human construct. After this realization is outlined, the major foundations/orientations of curriculum are explained. That is, the ideas that curriculum is built upon. Again, the focus in this explanation is on the human nature of these constructs. These explanations also provide a lens of analysing and understanding the collected data, which will be presented in Chapter Four. Once foundations/orientations of curriculum are outlined, the nature of the curriculum design and development is examined. Then by taking the general ideas for curriculum design and development, the literature that explains how these processes may be

influenced by stakeholders and other contextual factors is reviewed. Finally, human tensions and the nature of deconstruction processes are examined.

### **2.1.1 The Tensions Associated with Defining Curriculum**

Almost all the books about curriculum read for this literature review start off by discussing the amorphous nature of curriculum's definition (Olivia, 1997). Many scholars admit there is not one universal definition for it. According to Portelli (1987), there are over 120 definitions of curriculum that appear in the professional literature. Marsh and Willis (1995) note that, "it is unlikely that any one definition can fully capture the myriad of emphases now associated with the term" (p. 7). Soltis (1978) uses an analogy describing the search for the definition: "Those who look for *the* definition of *curriculum*, are like a sincere but misguided centaur hunter who, even with a fully provisioned safari and a gun kept always at the ready, nonetheless will never require the services of a taxidermist" (p. 364). Many books provide lists of examples of the varying definitions of curriculum. Because of the varying perspectives, many authors retreat back to the word's Latin roots. "Curriculum means race course" (Connelly & Clandinin, 1988, p. 4). Connelly and Clandinin (1988) explain that curriculum is not generally considered as a complicated concept. In fact, they see it as a "more or less straightforward, common-sense notion [and that it is] lost in a welter of different possibilities" (Connelly & Clandinin, 1988, p. 4). It seems as time goes on, people get more frustrated with defining curriculum. A more contemporary work about curriculum by Ornstein and Hunkins (2009) uses stronger words when explaining the curriculum field. They assert that various definitions of curriculum contribute to a lot of confusion when trying to discuss curriculum as a field of study. They say that it has been characterized as "elusive, fragmentary, and confusing" (Ornstein &

Hunkins, 2009, p. 1). They resolve this discontent by explaining that curriculum is not meant to provide precise answers, but to encourage an understanding and appreciation for its complexities.

Definitions of curriculum are cited on a spectrum of general to specific. Curriculum can be defined broadly, for example, as “a course of study” (Connelly & Clandinin, 1988, p. 4), or “a plan for learning” (Wiles & Bondi, 1984, p. 3). It can include “everything that goes on within the school, including extra-class activities, guidance, and interpersonal relationships” (Olivia, 1997, p. 4). These general definitions include all the aspects involved in the “course” (Connelly & Clandinin, 1988, p. 4) or “plan” (Wiles & Bondi, 1984, p. 3). It can be anything from the planned experiences for students to a specific textbook used. Narrowing the definition for curriculum more often sees curriculum defined as one part of the entire course of study. Some examples include “Curriculum is a set of subjects...Curriculum is content...Curriculum is a set of materials...Curriculum is a set of performance objectives [or]...Curriculum is a sequence of courses” (Olivia, 1997, p. 4). It is insufficient to limit the definition of curriculum to just one aspect such as “content” (Olivia, 1997, p. 4) or “subjects” (Olivia, 1997, p. 4). Olivia (1997) notes that, “The school that accepts the definition of curriculum as a set of subjects faces a much simpler task than the school that takes upon itself responsibilities for experiences of the learner both inside and outside the school” (1997, p. 4). For the sake of simplicity, it may be worthwhile to study curriculum as specifically defined pieces, but making one bold definition does not represent the medley of ideas the word encompasses.

The fact that people have provided multiple definitions of curriculum exemplifies the underlying theme for this thesis: curriculum is a human construct. Because of this human construct, curriculum is riddled with differing points of view. The reasoning for these different points of view is because of the differences between the people attempting to define it. This is

what makes curriculum “intensely historical, political, racial, gendered, phenomenological, autobiographical, aesthetic, theological, and international” (Pinar et al., 1995, p. 847). Pinar et al.’s quote is important because it emphasizes that one’s experience – history, political views, gender, etc. – all become manifest in the curriculum process.

### **2.2.1 Defining Curriculum Construction as Curriculum**

In this thesis, it is necessary to provide a definition for curriculum that serves as a foundation for this study. The focus in this study is investigating the human nature of the curriculum experience as experienced by the stakeholders throughout the curriculum construction process. A stakeholder is defined as, “A person or group of persons with a right to comment on, and have input into, the curriculum program offered” (Connelly & Clandinin, 1988, p. 124). The thesis investigates the stakeholders’ experiences in the curriculum construction process as a curriculum itself. This research works under the general definition of curriculum as a “plan for learning” (Wiles & Bondi, 1984, p. 3). The curriculum stakeholders have probably learned something from the construction of the curriculum. The construction process itself is indeed a plan for learning, whether it is designed as such, or not, and whether the stakeholders acknowledge it as such, or not.

A more specific definition of curriculum alludes to the processes of thinking this study investigates. Belth (as cited in Connelly & Clandinin, 1988) states that, “Curriculum is considered to be the increasingly wide range of possible modes of thinking about men’s experiences—not the conclusions, but the models from which conclusions derive, and in context of which these conclusions, so-called truths, are grounded and validated” (p. 5). This definition explains there are many different perspectives one can have about an experience. It focusses on curriculum being the reasons or events that lead one to a conclusion. It is not focussed on the

product, but rather how the product is attained. It acknowledges that the “truths” (Connelly & Clandinin, 1988, p. 5) or “conclusions” (Connelly & Clandinin, 1988, p. 5) are validated by each person’s context. That is, each person’s situation makes the conclusions drawn from it reliable. Stakeholders in the curriculum construction process come to different conclusions about the experience simply because they are different people with different backgrounds. The fact that they experience the process with those different backgrounds validates the conclusions.

The definition that follows captures specifically what this study investigates. Tanner and Tanner (1995) regard curriculum as the “reconstruction of knowledge and experience that enables the learner to grow in exercising intelligent control of subsequent knowledge and experience” (p. 189). This is the definition the thesis works under when investigating the experiences of the stakeholders involved in the curriculum construction process of the *Provincial Grade 12 Chemistry Curriculum Framework* (2013) curriculum document. Tanner and Tanner explain that knowledge and experience is rebuilt or reorganized in such a way that the learner achieves a new level of understanding. This new level of understanding gives the learner power to deal with future situations in a more informed way. One way to look at this definition is that the curriculum document itself is a re-ordering of knowledge and experiences for students so they can grow to the next level. This thesis applies this in a different way: the learners themselves (in this case the curriculum stakeholders) experience the curriculum as a reconstruction of their own knowledge and experience. That is, a reconstruction of the stakeholders’ views of chemistry education. This study investigates how, if at all, the stakeholders experience the curriculum construction process as a curriculum that has them “reconstruct their knowledge and experience” (Tanner & Tanner, 1995, p. 189) about chemistry education. It investigates whether this reconstruction took place to bring them to a new level of

understanding, which allows them to “exercise intelligent control of subsequent knowledge and experience” (Tanner & Tanner, 1995, p. 189) in chemistry education.

### 2.2.2 Types of Curriculum

There are many different types of curriculum that focus on specific aspects of the general “plan for learning” (Wiles & Bondi, 1984, p. 3). Some examples include the recommended/ideological curriculum, written/formal curriculum, informal curriculum, supported curriculum, taught/actual/operationalized curriculum, tested curriculum, learned/experienced curriculum, hidden curriculum, and the null curriculum. Although all of these types of curriculum exist in the Chemistry curriculum in the province, this thesis focusses only on a few of them.

The first is the written/formal curriculum. The case study of this thesis is the construction of the *Provincial Grade 12 Chemistry Curriculum Framework* (2013) curriculum document. This is a written/formal curriculum. It is a document that outlines what is mandated for all Grade 12 chemistry teachers in the province. Doll (1986) considers this as part of the “planned curriculum...[that] embraces content...categorized within subjects and subject fields” (p. 7). That is, the document outlines what chemistry content is to be taught. Ellis (2004) also offers a clear explanation of what is termed the “prescriptive curriculum” (p. 4). It is “what ‘ought’ to happen...take the form of a plan, an intended program...about what needs to take place in a course of study” (Ellis, 2004, p. 4). Ornstein and Hunkins (2009) also refer to this as the “planned curriculum” (p. 17) and explain the typical origin of it. It is “developed after considering several options and is usually prepared by a curriculum committee of the school or school district” (Ornstein & Hunkins, 2009, p. 17). Eisner (1979) refers to this “planned curriculum” (Ornstein & Hunkins, 2009, p. 17) as the “explicit curriculum” (p. 87). He explains

that the “explicit curriculum...[contains] goals and objectives... [that] appear in school district curriculum guides and the course-planning materials” (Eisner, 1979, p. 88). Sowell (2005) outlines in more detail the levels of curriculum that lead to the “explicit curriculum” (Eisner, 1979, p. 88) which he calls the “institutional level curricula” (p. 6). He defines the “institutional level curricula” (Sowell, 2005, p. 6) as the “district or school’s written documents containing standards, philosophies, and lesson plans” (Sowell, 2005, p. 6). Sowell also explains the origin of these curricula as derived from the “societal curricula” (Sowell, 2005, p. 6). He explains that the curriculum construction committee will often take a “societal curriculum” (Sowell, 2005, p. 6) and modify it to provide context for the community in which it is implemented. This curriculum is explained as the most distant curriculum from the learners. It is typically the first, most general form of curriculum passed on to other committees. This curriculum “decide[s] the purpose of education and the content to be studied in most school curricula...designed by the public, which includes politicians, representatives of special interest groups, school administrators, and professional specialists” (p. 5).

Many authors explain the nature of curriculum in two realms. For example, Ornstein and Hunkins (2009) describe it in terms of the “planned or formal curriculum and unplanned or informal curriculum” (p. 11). The “planned or formal curriculum” (Ornstein & Hunkins, 2009, p. 11) refers to the written/formal curriculum described above. Glatthorn, Boschee, and Whitehead (2009) describe the two realms as “prescriptive and descriptive curriculum” (p. 3). The “descriptive curriculum” refers to the “experienced curriculum” (Glatthorn, Boschee, & Whitehead, 2009, p. 3). Ellis (as cited in Glatthorn, Boschee, & Whitehead, 2009) explains clearly that the “experienced curriculum...[is] not how things ought to be...but how things are in real classrooms” (p. 5). The “prescriptive curriculum” (Glatthorn, Boschee, & Whitehead, 2009,

p. 3) is an ideal of what the classroom should look like, but in actuality, can end up being very different than intended. Ornstein and Hunkins (2009) explain this as a “socio-psychological interaction...[dealing with] feelings, attitudes, and behaviours” (p. 11). Sowell (2005) calls this the “experiential level of curriculum” (p. 5). Godlad and Su (as cited in Sowell, 2005) give reasoning for the difference often observed between the “instructional and experiential” (Sowell, 2005, p. 6) levels of curriculum. The “experiential curriculum” (Sowell, 2005, p. 6) is:

The one perceived and experienced by learners. What is experienced differs from one student to the next because learners have different backgrounds, motivations, and levels of aspirations...For example, some learners form purpose for learning experiences similar to those held by teachers, but other learners hold very different purposes or no purposes at all. Therefore, the experiential curriculum is the one internalized and made personal by learners (Godlad & Su, as cited in Sowell, 2005, p. 6).

If the stakeholders in the curriculum construction process are considered learners, they too have “different backgrounds, motivations, and levels of aspirations” (Godlad & Su, as cited in Sowell, 2005, p. 6). This thesis investigates if the stakeholders brought any purpose, not only for what students should learn in chemistry, but also purpose for their own learning through the curriculum construction process.

Perhaps stakeholders experience the curriculum construction process itself as a form of *currere*, the running of the course (Pinar & Grumet, 1976). More specifically, Pinar (2004) defines *currere* as a way “to study the relations between academic knowledge and life history in the interest of self-understanding and social reconstruction; to understand the contribution academic studies makes to one’s understanding of his or her life” (p. 35-36). Perhaps the stakeholders, through experiencing the curriculum construction process, come to understand themselves more by linking their own life backgrounds with the academic chemistry education knowledge. Perhaps the curriculum construction experience produced a reconstruction of their ideas about chemistry education. It may not have been so much a deliberate “interest of self-

understanding and social reconstruction” (Pinar, 2004, p. 35-36), but rather something that just happened. This research investigates this journey via phenomenology within a case study. The participants are called back to their “lived experience...those spheres of time, space, and experience that ontologically antedate all conceptualization” (Pinar & Reynolds, 1992, p. 4). The phenomenology of the stakeholders experience with the curriculum construction process reveals the “multivocality, multiperspectivity, and ‘lived’ aspects” (Pinar & Reynolds, 1992, p. 7) of the process as a whole.

Aoki (2005), a strong voice in phenomenology, calls the two main realms of curriculum (as described above by other authors) as the “curriculum-as-plan [and] curriculum-as-lived-experiences” (p. 159). He describes an interesting dialectic nature between these two types of curriculum. When describing a teacher’s situation he states that her “pedagogic situation is a living in tensionality – a tensionality that emerges, in part, from indwelling in a zone between two curriculum worlds: the worlds of curriculum-as-plan and curriculum-as-lived-experiences” (Aoki, 2005, p. 159). This is an interesting perspective that Aoki describes. He uses the strong word “tensionality” (Aoki, 2005, p. 159). It implies that there exists a struggle in bridging the gap between what a curriculum intends for students to learn, and what they actually learn. Freedman (1988) also sees a disturbing challenge when moving between the two worlds Aoki describes. Freedman explains one possible origin of this tensionality. She claims that, “Experts see the books, not the teacher, as defining the curriculum and determining the education-or-miseducation-of the child. If the teacher adheres strictly to the text, the child should learn. But, frequently, there is a price to pay, both intellectually and emotionally” (Freedman, 1988, p. 210). Again, Freedman, just like Aoki, uses strong words that portray discomfort in the gap between “curriculum-as-plan [and] curriculum-as-lived-experience” (Aoki, 1995, p. 159). She then goes

on to explain a specific tension experienced by a teacher participating in her study: panic. The teacher describes the panic she experiences when trying to cover the massiveness of the required curriculum, while dealing with the life problems of all her students.

I bring Aoki's idea of tensionality up at this point because of its application to this research. In the case of the curriculum stakeholders, they have a "curriculum-as-plan" (Aoki, 1995, p. 159), that is, developing the intended Grade 12 Chemistry curriculum. This research investigates this world of potential tensionality they experience while moving between the world of developing the official document and the world of their actual lived experiences while doing so.

### **2.3 Curriculum as a Human Construct**

One important realization about curriculum is that it is constructed by humans. No matter how it is defined or what type of curriculum it is, it is a social endeavour. Ornstein and Hunkins (2009) describe curriculum as resulting from social relationships. The reason for curriculum is too commonly motivated by seeking to use curriculum and the learning associated with it to address both present and future situations. Again, Ornstein and Hunkins (2009) highlight the human involvement and how humans are affected by creating curriculum for present and future purposes. Due to the social nature of curriculum, it is a dynamic field (Ornstein & Hunkins, 2009).

One reason for the "marble cake" (Bell, Carr, & Jones, 1995, p. 99) attribute of the written curriculum is due to the human involvement. According to Goodlad (1979), the ideal curriculum rarely influences the written curriculum. The reasoning is that teachers who are curriculum stakeholders make decisions primarily on their knowledge of the subject, their teaching experience, and their perceptions of their students. That is, curriculum stakeholders who

have worked as teachers base their contributions to the construction process on their own knowledge, experiences, and views. Teachers working as stakeholders do not tend to focus on the desired curriculum set by experts in the field (Glattorn, Boschee, & Whitehead, 2007).

Sowell (2005) agrees by saying that:

Curriculum processes involve decision making by people who are guided by their beliefs and values about what students should learn. Furthermore, because this process is sociopolitical, the beliefs and values incorporated in any particular curriculum may or may not be held by those who use them in classrooms...Developers...must arrive at decisions after careful thought, because living with the consequences of decisions made by default or haste is difficult (p. v)

This research investigates the extent to which curriculum decisions were made after “careful thought” and if living with the consequences is “difficult” (Sowell, 2005, p. v). Sowell then makes a recommendation for dealing with the tensions produced by people working together. He explains that curriculum change can only occur “after individuals have made internal transitions” (Sowell, 2005, p. v). He admits that these “transitions take time, understanding, and support on the part of all people involved” (Sowell, 2005, p. v). This thesis investigates what Sowell is talking about. It investigates the nature of the “internal transitions” (Sowell, 2005, p. v) of the stakeholders developing the curriculum, if any occurred at all.

Unruh and Unruh (1984) also discuss the major challenge with the human nature of curriculum construction. They present the obvious by saying that it is challenging to get people to meet together in one physical place at a set time. They follow up with a larger challenge: “consensus on basic theoretical assumptions” (Unruh & Unruh, 1984, p. 63). They add on another two layers of challenges to consider. They explain that the sheer complexities of the theories, and the “magnitude[s] of [their] importance” (Unruh & Unruh, 1984, p. 63) reveal themselves as challenges when constructing curriculum. Marsh and Willis (1995) suggest a reason why “basic theoretical assumptions” (Unruh & Unruh, 1984, p. 63) are often not easily

agreed upon. They explain that, “Different positions cannot be understood until they have been clearly enunciated, explored, and subjected to criticisms. Then and only then can informed consensus be reached” (Marsh & Willis, 1995, p. 138). They explain that the deliberation can appear as inefficiency. They claim that the disagreement is not wasted time, but rather beneficial to change. That is, if change is what the stakeholders are seeking. This is an important point to consider in this thesis’s research. Were different positions clearly explained and explored by the curriculum committee members? A second question is if the stakeholders were looking for change at all? Or was their desire to churn out a curriculum that was much the same as the previous one?

In his book, *The Character of Curriculum Studies*, Pinar (2011) discusses the role that personal history plays in open-mindedness. He concludes that, “What holds us back are resistances whose origin is to be sought in the archaic layers of our personal history” (p. 36). There are walls that people put up in their minds that stop new ideas from entering. Those walls are built and reinforced by events that have happened in their lives. Pinar explains that this is detrimental to producing any sort of change in curriculum. He says the same old curriculum is produced. It is “a compulsive repetition of the same concepts...with which it inaugurated itself...as ‘new’” (Pinar, 2011, p. 36). Connelly and Clandinin (1988) dedicate a chapter in their book, *Teachers as Curriculum Planners Narratives of Experience*, that helps alleviate the tendency to put walls up when new ideas come forward. The chapter is called “Understanding Yourself” (Connelly & Clandinin, 1988, p. 11) and commonsensically explains that:

For each of us, the more we understand ourselves and can articulate reasons why we are what we are, why we do what we do, and are headed where we have chosen, the more meaningful our curriculum will be. The process of making sense and meaning of our curriculum, that is, of the narratives of our experience, is both difficult and rewarding. (Connelly & Clandinin, p. 11)

It can be difficult to articulate our pasts, and even if so, it can be hard to relate certain events to explaining why we have certain views about certain topics. Connelly and Clandinin explain this in the context of a teacher implementing curriculum, but this same notion can be applied to stakeholders in curriculum. If a developer can first get inside their own head and understand their own views, then perhaps they can be more open to others.

In the book *Curriculum Theorizing*, Pinar (1975) collects works from many curriculum scholars who set benchmarks in the curriculum field. For example, Macdonald (1971) makes a general statement about curriculum and its human nature. He says that, “All curriculum design and development is political in nature; that is, it is an attempt to facilitate someone else’s idea of the good life by creating social processes and structuring an environment for learning” (Macdonald, 1971, p. 293). He bases these conclusions by bringing in an idea from Habermas (as cited in Macdonald, 1971). That is, that “all knowledge is grounded in human interest” (Macdonald, 1971, p. 287). The reasoning for a stakeholder’s contribution to curriculum can be for “self-preservation” (Macdonald, 1971, p. 287). This is what the person considers to be the “good life” (Macdonald, 1971, p. 293). That is, what that person’s fantasy of what an ideal life entails. Macdonald (1971) explains that even if someone is only involved in the curriculum process for “self-preservation,” that “self-preservation” is still defined by the “cultural conditions of work, language, and power” (Macdonald, 1971, p. 287). This is an interesting point because even if someone is just doing something for themselves, those selfish desires are rooted in the desires of their surrounding community. This can be a reason for accepting curriculum construction ideas from others, even if the reason seems to be for self-gain.

## **2.4 Foundations/Orientations of Curriculum**

Central to this study is awareness of the many foundations and orientations of curriculum, especially the phenomenological and autobiographical curriculum. The foundations of curriculum provide a framework to build upon when designing and developing curriculum. In its core, curriculum as a field of study refers to other disciplines. Ornstein and Hunkins (2009) and Eisner (1979) provide useful categories of how curriculum can be expressed. Ornstein and Hunkins divide up the foundations of curriculum into four main categories: “philosophical...historical...psychological...[and] social” (Ornstein & Hunkins, 2009, p. v). Eisner describes, what he calls, “orientations to the curriculum...[as] academic rationalism, the development of cognitive processes, personal relevance, social construction and reconstruction, and curriculum as technology” (1979, p. 62-79). A curriculum often has a blend of these foundations/orientations creating the “marble cake” (Bell, Carr, & Jones, 1995, p. 99) curriculum. This section of the literature review explains the aspects of each foundation/orientation. It is important to understand these building blocks in order to analyze and understand the data collected in this study.

### **2.4.1 Foundations of curriculum (Ornstein & Hunkins, 2009).**

#### ***2.4.1.1 Philosophical foundations.***

The most general description of philosophy in education comes from John Dewey. To Dewey (1938), philosophy is a certain way of thinking that helps make meaning of our lives. He suggests that philosophy underpins every decision made in an educational context. Ralph Tyler (1949) agrees and describes philosophy in terms of a filter. He describes philosophy as a “screen for selecting objectives and eliminating objectives...[It] attempts to define the nature of a good life and a good society” (Tyler, 1949, p. 34). Again, educational decisions are based on the

philosophy that the decision-makers hold. Wiles and Bondi (1984) describe many ways that philosophy permeates curriculum leadership. They state that philosophy, “suggest[s] purpose in education, clarify[ies] objectives and activities in schools, suggest[s] learning theories, define[s] the roles of persons working in curriculum, and guide[s] the selection of strategies for curriculum change” (Wiles & Bondi, 1984, p. 43). Again, the decisions made in education are based on the outlined philosophies of the people involved.

A philosophy can provide answers to three big questions: “What is good? What is true? [and] What is real?” (Wiles & Bondi, 1984, p. 43). The axiology (defining what is good) in terms of curriculum outlines the values that should be reflected. The epistemology (defining what is true) in terms of curriculum deals with how students should learn the truths. Lastly, the ontology (defining what is real) in a curriculum context refers to the content which students should learn. Of course, there are many perspectives that can answer these questions. Curriculum stakeholders bring to the table a wide range of answers to these basic philosophical questions (Wiles & Bondi, 1984).

Ornstein and Hunkins (2009) suggest that philosophy sets up an organizational structure for curriculum construction: a framework. They suggest that philosophy guides decisions in school. Van Til (as cited in Ornstein & Hunkins, 2009) points out that, “Without philosophy, [we make] mindless vaults into the saddle...[We] ride madly off in all directions” (p. 31). This quote reflects the idea of a framework. A framework is something to follow. Without this guide, the structure can indeed project in all directions, or even collapse on itself. Ornstein and Hunkins also suggest that philosophy can be either something that is revisited over and over during curriculum construction, or used as a starting point. Firstly, the philosophy can be amended throughout the process so the details of curriculum are succinct with the overall framework.

Secondly, the philosophy can be a starting point, where all the details about curriculum reflect the initial decisions made about the overarching philosophy (Ornstein & Hunkins, 2009).

There are many types of educational philosophies. For curriculum stakeholders, the medley of philosophies represented comes out in the curriculum construction process. In this next section, the major educational philosophies are outlined. Together they encompass a broad range of philosophies that would produce many different visions in the construction of a curriculum. This is important for informing and interpreting the data collected from the interviews with the stakeholders of the Grade 12 Chemistry curriculum.

Each educational philosophy is rooted in each of the main philosophical traditions. Perennialism is rooted in realism, essentialism comes from idealism and realism, and progressivism and reconstructionism originate from pragmatism (Ornstein & Hunkins, 2009).

#### *2.4.1.1a Perennialism.*

Perennialism is rooted in realism, the most conservative philosophy. The perennialist view of education wants to “cultivate reason and...develop children’s intellectual powers” (Doll, 1986, p. 31). This philosophy relies heavily on the past and stresses traditional values. It is subject-centered. Content is emphasized, organized in a structured format. Students are taught universal, definite, external truths. “Theory and principles tend to come first in the learning experience; application or practice follows” (Doll, 1986, p. 33). The goal of education for perennialists remains constant (Wiles & Bondi, 1984): to prepare students for the future ahead (Olivia, 1997). The goal is to teach rationality and “develop the mind” (Ornstein & Hunkins, 2009, p. 39). Perennialism suppresses the immediate needs of learners. Olivia (1997) states that, “The perennialist agrees with the essentialist that education is preparation for life but opposes the progressivist who holds that education *is* life...The perennialist looks backward for the answers

to social problems” (p. 179). That is, the emotions in the moment of learning is overcome the by external truths (the academic content) put upon the learners.

#### *2.4.1.1b Essentialism.*

The second major educational philosophy, essentialism, draws its ideas from both realism and idealism. The essentialist philosophy was a reaction to progressivism in the nineteen fifties and sixties, which explains its similarity to perennialism (Ornstein & Hunkins, 2009).

Along with perennialism, essentialism is a conservative approach. Ornstein and Hunkins (2009) explain that, “Like perennialism, essentialism is subject-centered; however, essentialism is not rooted in the past” (p. 41). It draws from the idealist philosophy in that, “Reality exists only as it is experienced” (Doll, 1986, p. 32). As with perennialism, essentialism favours academic subjects (with emphasis on science, mathematics, and new technology) and values facts and knowledge. One difference is that essentialists also emphasize problem solving and conceptual thought (Ornstein & Hunkins, 2009). Essentialist education produces people who look back on problems to solve with their new found knowledge. There is a social justice element that essentialists try to exercise (Doll, 1986) once the facts, knowledge, and skills are attained. Wiles and Bondi (1984) explain that, “Reality is seen as a world within a person’s mind... Goodness is an ideal state, something to be strived for” (p. 51). In part, essentialism is similar to perennialism in that they are both subject-centered. Essentialism has an extra bit that puts the onus on the individual to take the commonalities of external truths and make sense of them in their own mind through conceptual thought (Ornstein & Hunkins, 2009).

An interesting point to note is that behaviouristic principles from psychology made their way into the education field because of the essentialist philosophy (Olivia, 1997). A typical behaviourist-essentialist “fragments content into logical, sequential pieces and prescribe the

pieces the learner will study” (Olivia, 1997, p. 181). Usually, the teacher starts a lesson with a rule or concept and then provides drills to attain mastery (Olivia, 1997). The idea is that “if the content has been thoroughly mastered, it can be easily retrieved” (Olivia, 1997, p. 181).

#### *2.4.1.1c Progressivism.*

Progressivism draws upon the pragmatic philosophy. This was a backlash against the perennialist philosophical view in education (Ornstein & Hunkins, 2009). The major leaders in progressivism (Dewey, Kilpatrick, Childs, and Bode, just to name a few) attested that it was time to “subordinate subject matter to the learner” (Olivia, 1997, p. 182). Progressivism reflects the child-centered approach, where the interests of the learners must be considered because they bring their “bodies, emotions, and spirits to school along with their minds” (Olivia, 1997, p. 182). Dewey’s most popular works, *Democracy and Education*, *Experience and Education*, *How We Think*, and *My Pedagogic Creed* all attest to this idea. Dewey (1938) explains that education is not imposed on students, but students and teachers construct it together. He explains that the conditions found in the present experience should be used as sources of problems for education. Furthermore, it is the teacher’s responsibility to take care that the problem grows out of conditions of the experience. It is also up to the teacher to arouse the learner to actively seek out information to produce new ideas. Progressivists do not see teachers as fact dispensing machines, but rather human moderators of learning. It takes into account individual differences where “education is life...[and students] learn by doing” (Olivia, 1997, p. 183).

Ornstein and Hunkins (2009) summarize the main idea of progressivism. They state that, “[progressivist] skills include problem-solving...scientific methods...cooperation and self-discipline...because reality is constantly changing...progressivism emphasizes *how* to think, not *what* to think” (Ornstein & Hunkins, 2009, p. 46). Other popular approaches have come from

progressivism, including humanistic curriculum (an emphasis on self-concept which defines affective outcomes rather than cognitive) and constructivism (students build understanding through experiences that are personally relevant) (Ornstein & Hunkins, 2009).

#### *2.4.1.1d Reconstructionism.*

As with progressivism, reconstructionism also stems from pragmatism. Historically, it was a response to the state of society during the Great Depression, destitute and desperate for change (Ornstein & Hunkins, 2009). The main theme that sets reconstructionism apart from the other philosophies is its socialist slant. Reconstructionists put “schools in the forefront in remaking society...[and] rebuild[ing] culture” (Doll, 1986, p. 35).

Counts (1932) popular pamphlet *Dare the School Build a New Social Order?* suggests using education to reconstruct or re-build society. Reconstructionism assumes that current mechanisms put into place by society to deal with social issues are inept of solving them. Therefore, the solution is an action-oriented approach. Counts’ believed that “education is not neutral” (Counts, 1934, p. 535). It is always changing and is dependent on the context in which it exists. Counts explained that it is good for children to be in charge of their own learning, but it is a narcissistic approach to life. It hides the social inequalities that exist in society. Counts challenged education so that students not only care about themselves, but others as well. He believed that “an idea is a plan of action...[and its] validity is determined by whether it is followed by the outcomes it predicts when it is actually put to the test of practice” (Counts, 1934, p. 218).

Reconstructionism has provided an opening for other approaches to education as well. For example, an internationalist curriculum emphasizes global issues. Another popular area that emerged from both progressivism and reconstructionism is reconceptualization. On the

progressive side, reconceptualists favour learner-centered and relevant curriculum decisions (Ornstein & Hunkins, 2009). They go further to emphasize “personal self-knowledge, particularly mystical, spiritual, and moral introspection” (Ornstein & Hunkins, 2009, p. 53). On the reconstruction side, they “believe that current society is marked by alienation, a failure to accommodate diversity, and indifference to people’s needs” (Ornstein & Hunkins, 2009, p. 53).

*2.4.1.1e The importance and challenge of developing philosophical foundations in curriculum.*

Wiles and Bondi (1984) deem it essential to clarify the beliefs about the purpose of education, that is, the educational philosophy. It gives direction to the construction of curriculum. They explain that, “Without direction, school programs meander, become targets for social pressure, or operate in a state of programmatic contradiction” (Wiles & Bondi, 1984, p. 89). In order to avoid these downfalls, the curriculum stakeholders need to develop a clear philosophy. In this process, there are decisions to make about what is valued. The first step is to become aware of the range of beliefs about education (Wiles & Bondi, 1984). Wiles and Bondi suggest that stakeholders “solidify their professional values [to be] better able to make consistent everyday decisions” (1984, p. 43). The key word “solidify” (Wiles & Bondi, 1984, p. 43) indicates the deliberate act of putting one’s philosophy of education in words as evidence of clarity (Olivia, 1997). Wiles and Bondi suggest doing this in a number of ways: review existing statements of philosophy and make necessary changes, make an interpretation of how each stakeholder’s philosophy of life transfers to a philosophy of education, and/or look for patterns of current philosophies in society in general.

Doll (1986) encourages that a curriculum team tend to develop more comprehensive and clearer philosophies, compared to individuals. He also describes a cyclical advantage where, “As

they [(stakeholders)] discuss curriculum philosophies, group members tend to become helpfully critical of their original purposes” (Doll, 1986, p. 31). Simply raising awareness about existing philosophies helps to define what a stakeholder’s stake is in the curriculum in the first place. Once philosophies of individual members are defined, “They may discover that they have adopted, as have perhaps a majority of educators, an eclectic approach to philosophy, choosing the best from several philosophies” (Olivia, 1997, p. 190). It is interesting that Bell’s “marble cake” (Bell, Carr, & Jones, 1995, p. 99) curriculum (as discussed in Chapter One) is represented by many educational philosophies within one foundation of curriculum-philosophical foundations.

Olivia (1997) outlines two major problems that arise when developing a philosophy. The first is that stakeholders charged with the task of drafting the philosophical statement “enter into the process with differing assumptions, sometimes unexpressed, about the learning process, the needs of society, and the roles of individuals in that society” (Olivia, 1997, p. 192). Olivia goes as far to say that if a consensus is not reached, the drafted philosophy is “useless” (Olivia, 1997, p. 192). The second challenge Olivia discusses is that philosophy statements can be too vague, leaving it open to different interpretations. She says that an indication of consensus of the philosophy’s idea is if stakeholders come to a consensus on the wording. She concludes by saying that reaching a consensus on the interpretations of the wording is almost impossible.

### ***2.3.1.2 Historical foundations.***

It is important to look back at history and reflect on what went well and what did not go so well. This is evident in curriculum studies. The reason for a new curriculum is because the old is no longer valid. The old is no longer doing what it needs to do. Curriculum stakeholders often

use old curricula as background for the construction of a new one. The question then becomes: is the new curriculum actually new, or is it just a re-packaged version of the old one?

Pinar (1992) writes, in quite a morbid way, about the importance of history in advancing curriculum studies. He states that, “As students of curriculum, we live and work in the aftermath of the death of our predecessors” (Pinar, 1992, p. 92). He explains that some of the first curriculum theorists sat in rooms and discussed pressing issues about curriculum, just as we do today. It is the task of the predecessors to pick up where they left off. Whether we realize or not, the past has a way of seeping its way into even the most progressive ideas. Pinar (1992) goes on to explain that, “Just as those who have died before us whisper and cry as we speak, our time, our place, ourselves, those who have not yet appeared and those who are appearing—our children—speak in our voices” (p. 100). It is the voices of the past that influence the voices of today. In the case of curriculum studies, this is significant.

Ornstein and Hunkins (2009) also bring up the importance of history as a foundation for the curriculum construction process. They say that, “Curriculum specialists, need an understanding of history to avoid repeating the mistakes of the past and to also prepare them for the future” (Ornstein & Hunkins, 2009, p. 70). They unpack this general statement in more detail. Firstly, they explain that in order to understand any theories in education, historical foundations need to be understood first. How can someone know how to interpret a new idea if they do not have an understanding of the historical context of that idea? Ornstein and Hunkins (2009) also explain that historical foundations “helps us integrate curriculum, instruction, and teaching...better understand the relationship between content and process...[and] understand relationships between what students of the past learned and what students now learn” (p. 70).

Sowell (2005) identifies a pattern that has been consistent with many new curricula developments around the world. She explains that educators often take a reactive rather proactive approach to developing new curricula. That is, educators tend to define what is wrong with the world, then design curriculum around providing solutions for those problems. It seems that Counts' vision of teachers leading society (as discussed above) has not been realized in the case of curriculum construction. Sowell explains that the changes occur in baby steps rather than on a large scale. A whole new curriculum is usually not created, but rather one that closely mirrors its predecessor. She adds more reasons to why curricula are often not completely overhauled. She deems the curriculum construction process as "messy, non-linear, and complicated" (Sowell, 2005, p. 133). Doll (1986) agrees with this and asserts that, "No single pattern...will suffice in solving all curriculum problems" (p. 25). Sowell mentions that working through the curriculum construction process requires a wide range of knowledge of "content, pedagogy, the context, and the curriculum processes" (Sowell, 2005, p. 133). She also mentions the very human nature of the curriculum process (the focus of this thesis) by saying that stakeholders must have good social skills because they have to "reconcile differing values, and manage several variables at once" (Sowell, 2005, p. 133).

Doll (1986) has also documented trends in curriculum evolution over time. Similar to Sowell (2005), Doll says that not only are curricula usually similar to their predecessors, but that they are "copied...from other schools and school systems" (1986, p. 21). Doing this eliminates the notion that curricula should be context dependent. The value a certain curriculum holds in one region may be totally different from the value it holds in another. A second trend is that the idea of educating all children is always supported in discussions, but not carried out in real life. There are still children who fall between the cracks of the educational system. A third trend is

that experiments are done with different curricula ideas, but they are unofficial, and the results “remain largely untested” (Doll, 1986, p. 21). On the other hand, educational ideas that have solid research are “adopted very slowly by practitioners” (Doll, 1986, p. 21). Good ideas in education tend to be supported more than researched evidence. Another trend that speaks to favoured stakeholders in curriculum is that, “National committees have determined general objectives, policies, and programs” (Doll, 1986, p. 21). A trend observed when teachers take part in the curriculum construction process is that they are expected to work over and above their regular role as a classroom teacher. Lastly, Doll points out the historical use of curriculum materials. Originally textbooks would define the course of study, until less prescriptive course guides were developed. More recently, emphasis has shifted to developing the teacher as a professional rather than limiting a teacher’s decision making power when implementing curriculum (by offering limited professional development opportunities). As national standard curriculum materials became more available, the power the teacher had to make critical decisions about curriculum again diminished. The reason is the national standard resources were again quite prescriptive. Teachers had to decide whether to make decisions about curriculum on their own, or go the safe route and follow the national standard materials. Most teachers would often take the latter (Doll, 1986).

It is important for curriculum stakeholders to understand the historical foundations of curriculum. This includes past theories of education and patterns seen in curriculum reform. The historical foundations provide a springboard for new curriculum construction, but also a basis for new ideas.

### *2.3.1.3 Psychological foundations.*

The psychological foundations of curriculum draw from the field of psychology in order to answer the question, how do students learn? Curriculum stakeholders consider proponents of psychology to validate the curriculum. After all, a curriculum is pretty well useless if students are not learning and gaining knowledge (Ornstein & Hunkins, 2009). In general, the psychological foundations of curriculum deal with learning theory. Hunter (1982) explains that choices made about learning theory dictate how teachers should teach. That is, the learning theories that stakeholders chose to put in a curriculum is a stance on how the material should be taught in the classroom.

Ornstein and Hunkins (2009) have divided the psychological foundations of curriculum into three groups, “behaviourism...cognitive psychology...[and] phenomenology” (p. 108-137). The main attributes of each of these groups are explained below to give an overview of learning theory that may be included in a given curriculum.

#### *2.3.1.3a Behaviourism.*

The “behaviourist or association theories...deal with various aspects of stimulus-response (S-R) and reinforcers” (Ornstein & Hunkins, 2009, p. 108). These theories focus on conditioning and altering the environment to provide certain responses from the learner. A curriculum developer who has a behaviourist view makes decisions about curriculum based on the positive experiences of the learner. Any negative experiences are dealt with to turn them into positive ones. Furthermore, Ornstein and Hunkins note that, “Behaviourists believe that the curriculum should be organized so that students can master the subject matter. However behaviourists are highly prescriptive and diagnostic; they rely on step-by-step, structured learning methods” (Ornstein & Hunkins, 2009, p. 115-116). Originally, behaviourist views relied on mimicking

what was found in animal behaviour results. More recently the behaviourist view has accepted the fact that learning deals with more complex cognitive processes. That is, learning cannot simply be broken down to a series of simple linear steps. Overall, behaviourists remain mechanistic in their approach. Another aspect is that behaviourists implore “careful analysis and sequencing of learners’ needs and behaviours” (Ornstein & Hunkins, 2009, p. 116). That is, behaviourists delicately craft incremental steps in order to produce certain behaviours. Behaviourism is the oldest form of cognitive psychology and its ideas are still relevant in today’s curriculum processes (Ornstein & Hunkins, 2009).

Some major developments in behaviourism include Thorndike’s idea on connectionism (connecting situations to stimuli, students learn if there is a positive connection), Pavlov’s and Watson’s work on classical conditioning (associating certain stimuli with a certain behaviours), Skinner’s operant conditioning (including positive and negative reinforcement), Bandura’s observational learning (students learn from observing others and seeing them as models), and Gagne’s hierarchical learning (eight types of learning that deal with the cognitive, psychomotor, and affective domains). They each contribute a piece to the general idea of behaviourism explained above.

#### *2.3.1.3b Cognitive psychology.*

A cognitive process can be described as how thinking happens. Cognitive psychologists are interested in how the mind is built. That is, how thinking processes happen. Ornstein and Hunkins (2009) describe cognitive psychology as “generating theories that give insight into the nature of learning, specifically how individuals generate structures of knowledge and how they create and/or learn reasoning and problem-solving strategies” (p. 118). Curriculum that has a cognitive-oriented approach emphasizes teaching students how to think. When people think of

the function of school, most equate it to a place where students learn in a cognitive way. That is, the focus of school is using the mind to think (Ornstein & Hunkins, 2009). This psychological foundation has a “structured style of teaching...[and] prefer[s] the problem-solving method, based on reflective thinking and/or the scientific method” (Ornstein & Hunkins, 2009, p. 137).

Cognitive psychology has been developed from some well-known approaches to curriculum such as the Montessori method (children learn at different rates), Piaget’s theories (identified four cognitive stages of development-each stage more and more complex), Vygotsky theory (learning involves human and environmental development), Bruner (learning how things are related, also developed inquiry-based learning), Garder (eight multiple intelligences), Guilford (identified many potential cognitive processes), and the work of Ennis, Lipman, and Sternberg (critical thinking approaches). Other popular approaches such as constructivism, creative learning, and discovery learning are also included in the cognitive psychology realm (Ornstein & Hunkins, 2009).

#### *2.3.1.3c Phenomenology.*

Phenomenology deals with how each person experiences a certain situation. It is the “study of immediate experiences as one’s reality” (Ornstein & Hunkins, 2009, p. 137). Because different people have different backgrounds, values, attitudes, and ideologies, they experience phenomenon differently. That is, one student may get something totally different out of a teacher’s lesson in comparison to another student in the same class. Ornstein and Hunkins (2009) regard this as a form of psychology which is “illustrated by individual self-awareness of an “I” who has feelings and attitudes, experiences stimuli, and acts on the environment” (Ornstein & Hunkins, 2009, p. 138). They also note that, “Our self-concept determines what we do, even to what extent we learn” (Ornstein & Hunkins, 2009, p. 138). Phenomenology has been hard to

chew on for some psychologists because phenomenologists focus on the “raw data of personal experiences” (Ornstein & Hunkins, 2009, p. 138). It is this “raw data” (Ornstein & Hunkins, 2009, p. 138) that validate the ideas. Ornstein and Hunkins also explain that, “The definitions and processes are also subjective and evaluative rather than precise and substantive” (Ornstein & Hunkins, 2009, p. 138).

Work by Maslow (identified the six human needs), and Rogers (freedom to learn by self-actualization) have helped develop phenomenology as a psychological foundation (Ornstein & Hunkins, 2009).

#### *2.3.1.3d Psychological foundations specific to chemistry teaching and learning.*

Because this study’s context is the *Provincial Grade 12 Chemistry Curriculum Framework* (2013) curriculum document, it is important that psychological foundations of learning theory specifically related to chemistry are discussed. Johnstone (1993) proposes that there needs to be a more conceptual approach in chemistry education, focusing on particulate representations rather than the algorithmic calculations. He describes the different dimensions of chemical understanding. The macroscopic dimension would be seeing the chemistry in real life (e.g. actually working with chemicals in demonstrations or labs). The second dimension is called the microscopic, which is looking at the particles themselves (e.g. building molecular models or computer simulations). The third dimension is the symbolic, which includes doing calculations or writing chemical equations. Often in chemistry, ideas and relationships are expressed in a symbolic or mathematical way which is the most abstract realm. In order to achieve a deep understanding of concepts, and hence connect its relevance and application, students must be able to represent the concepts at the particle level. That is, what the particles in a chemical system are doing and how they are behaving and interacting. This mode is a way to connect the

macroscopic (visual) mode to the symbolic. The problem is that the jump from real world chemistry (macroscopic) to abstract equations (symbolic) neglects a psychological understanding of why a chemical system behaves the way it does. This psychological level helps students make sense of and understand chemical concepts.

#### ***2.3.1.4 Social foundations.***

The social foundations of curriculum deal with society and its relation to education. Curriculum has always been influenced in one way or another by what is going on in society. Wiles and Bondi (1984) note that education “is an open system, susceptible to all currents of political, economic, and cultural change” (p. 26). Societal pressures have a huge influence on curriculum construction. Who decides which of these forces are worthy for curriculum? Even when the stakeholder team is decided, which of the stakeholders *actually* end up influencing it? These are big questions that arise when examining society in relation to curriculum. Ornstein and Hunkins (2009) explain clearly the importance of social forces on curriculum. They state:

Understanding social foundations of curriculum is essential because such foundations have always had major influences on schools and curriculum decisions. Comprehending those forces in society at large and locally enables educators to determine what aspects of society to transmit to current and future students, and what dimensions of society require reinvention. Curriculists must be social historians, current social analysts, and social futurists. Current and future consideration of society, education, and schooling are challenging in light of the diversity of our local, state, national, and international societies (Ornstein & Hunkins, 2009, p. 177).

Doll (1986) highlights social influences that have traditionally permeated curriculum construction. The first is law. He explains that laws are more often created than taken away. This puts extra restrictions on what curriculum dictates students to learn in school. Another point emphasized by Doll is the human nature to resist change. He states that, “Many teachers cannot prove that their curricula and methods of teaching are actually functioning for improved learning,

but they will resist strenuously any effort to bring about change...numerous traditions exist today without justification or validity” (Doll, 1986, p. 88-89). Doll reminds curriculum stakeholders to learn how to deal with people who do things a certain way because “[they]’ve always done it... [that] way!” (Doll, 1986, p. 89)

Doll (1986) also highlights the effects of social and cultural change on curriculum. He explains that society is always changing, although the point of tradition is to “hold social forces in check” (Doll, 1986, p. 90). He explains further that, “Tradition is sometimes beneficent, and curriculum personnel must find specific traditions that are good and then see that these traditions are strengthened and used” (Doll, 1986, p. 117). Stakeholders should analyze what traditionally works and what does not. Keep the things that work, and dump or re-work the things that do not. Another point Doll (1986) makes is that “[curriculum workers] are deep in politics” (p. 116). He also discusses a more obvious social influence: the development and communication of knowledge via media and technology. Third, he points out the effect of changing financial support put into curriculum construction.

Doll (1986) concludes his writing with some strategies for curriculum stakeholders. First, he suggests curriculum workers to be “as open-minded as they can be about influences that affect the schools” (Doll, 1986, p. 115). Second, he suggests that curriculum workers take the lead in social influence. That is, curriculum workers should “inform” the public as well as “listen” (Doll, 1986, p. 115) to them concerning curriculum issues. Along with this, stakeholders should “take direct responsibility for channeling social and cultural change” (Doll, 1986, p. 117).

#### *2.3.1.4a Social foundations specific to chemistry teaching and learning.*

There is a model proposed by Mahaffy (2006) that builds upon Johnstone’s (1993) model of teaching and learning in chemistry (discussed earlier). Johnstone proposed the triangular

model: macroscopic, particulate, and symbolic levels of understanding in chemistry. Mahaffy's model adds another level of understanding called the "human element" (Mahaffy, 2006, p. 50). The human element expresses chemical concepts in terms of a historical, applicable, or societal context. Maffy's model is a psychological foundation that has a social foundation (the "human element" (Mahaffy, 2006, p. 50)) nested within in it.

#### **2.4.2 Orientations to curriculum (Eisner, 1979).**

In Eisner's (1979) book, *In educational imagination: On the design and evaluation of school programs*, he neatly categorizes five orientations to curriculum. He puts it in a straight forward way that covers the range of approaches one can have toward curriculum. These orientations are useful as a lens when developing or analyzing curriculum. There is some cross over with Ornstein and Hunkins' (2009) four major foundations. Eisner's are described separately below for sake of clarity. He suggests five main "orientations to the curriculum: ...academic rationalism...the development of cognitive processes...personal relevance...social adaptation/reconstruction...[and] curriculum as technology" (Eisner, 1979, p. 62-79).

##### **2.4.2.1 Academic rationalism.**

The first orientation, "academic rationalism" (Eisner, 1979, p. 66), refers to teachers emphasizing content. Eisner (1979) states that, "This orientation argues that the major function of the school is to foster the intellectual growth of the student in those subject matters most worthy of study" (p. 66). It is studying a subject for its own sake. It is studying a subject because of the unlikelihood that a student would come across studying the discipline somewhere other than school. It is studying a subject that has its own "content, concepts, and patterns of inquiry" (Eisner, 1979, p. 67).

#### ***2.4.2.2 Development of cognitive processes.***

The second orientation Eisner (1979) proposes is the “development of cognitive processes” (Eisner, 1979, p. 62). It refers to teaching students how to think. This orientation’s function is to “(1) help children learn how to learn and (2) provide them with the opportunities to use and strengthen the variety of intellectual faculties that they possess” (Eisner, 1979, p. 62). This includes cognitive capabilities such as making inferences, speculations, and locating and solving problems. Within this orientation, teaching is not viewed as imparting knowledge onto students, but rather, helping students learn to inquire (Eisner, 1979).

#### ***2.4.2.3 Personal relevance.***

As the third orientation, “personal relevance” (Eisner, 1979, p. 69) refers to making content relevant to students’ everyday lives. It is a curriculum that, “Is to emerge out of the sympathetic interaction of teachers and students” (Eisner, 1979, p. 69). Eisner explains that in order for an experience to be educational, the students have to be involved in its development. The teachers connect the material with the students’ everyday lives to make it meaningful.

#### ***2.4.2.4 Social adaptation and social reconstruction.***

The fourth orientation to curriculum combines two sub-orientations into one. They are “social construction and social reconstruction” (Eisner, 1979, p. 74). “Social construction” (Eisner, 1979, p. 74) looks at teaching students to conform to what society has already established. Its function is to maintain the status quo. It is to pass down what society has already established. It is to have students make decisions about problems based on what society already has in place to deal with them. Often, certain customs, traditions, and historical ways of doing things are passed down (Eisner, 1979).

“Social reconstruction” (Eisner, 1979, p. 74) looks at teaching students to see society as broken and needing reformation. This orientation is aimed at “developing levels of critical consciousness among children and youth so that they become aware of the kinds of ills that the society has and become motivated to learn how to alleviate them” (Eisner, 1979, p. 76). It focuses on controversial issues and encourages students to come up with solutions to transform society (Eisner, 1979).

#### ***2.4.2.5 Curriculum as technology.***

The last orientation that Eisner (1979) defines is “curriculum as technology” (p. 79). It refers to using curriculum as a series of steps in order to achieve some end product. It looks at “curriculum planning as being essentially a technical undertaking, a question of relating means to ends once the ends have been formulated” (Eisner, 1979, p. 79). It looks at curriculum as systematizing educational planning. It requires teachers to formulate purposes and to use those purposes as criteria for evaluating the effectiveness of the plans made in the first place (Eisner, 1979).

### **2.5 Mid-Chapter Summary**

This first section of the literature review discussed the various definitions of curriculum and the tensions associated with it. It then explained how the curriculum construction process itself is indeed its own curriculum. The types of curriculum involved in this study were then explained. Next, the literature addressing how curriculum is a human construct was explained and reviewed. These sections set the stage for the next sections which dealt with the different foundations and orientations that generally exist in curriculum studies. They can be used as lenses in both curriculum construction and analysis. The explanation that has been provided

above will aid in understanding the data collected from the contextual study of the construction of the *Provincial Grade 12 Chemistry Curriculum Framework* (2013) curriculum document.

This thesis explores the human nature involved in each of the foundations of curriculum. In each section of the literature review, each topic is investigated from a humanistic point of view. Each topic is explained in general terms. The dynamics of the human interactions present in the processes of each topic are emphasized. This theme holds true for the following sections on curriculum design, curriculum development, the influence of stakeholders and context on design and development, and human tensions and deconstruction processes. Ornstein and Hunkins (2009) order the curriculum process in the following steps: design, development, implementation, and evaluation. This thesis focusses only the first two steps: design and development. Implementation and evaluation are beyond the scope of this research, but lend themselves as possibilities for future study.

## **2.6 Curriculum Design**

Henderson and Gornik (2007) describe curriculum design as “an image of what is to be developed, much like an architect gives clients a drawing of the house to be built...curriculum design guides teachers’ and students’ classroom curriculum planning” (p. 94). There are many models in curriculum design. The focus is not to explain the details of these models, but rather provide general explanations of major ones. Again, the focus for each section is on the human interactions that occur in designing a curriculum as a whole.

Grumet (1992) discusses a dialectic that occurs between person and world. She states that, “Those charged to design curriculum flee from ambiguity to mechanistic and analytic descriptions of the process of education” (Grumet, 1992, p. 31). Human nature is extremely complex and often cannot be expressed as a series of linear steps. It is clear why curriculum

designers may fall back to this approach: it is easier and more straight-forward. Ornstein and Hunkins (2009) explain that, “Curriculum design must be carefully considered so that the curriculum will impart essential concepts, attitudes, and skills” (p. 205). They make the connection that each design is associated with a particular philosophy. This must be considered when designing curricula.

### **2.6.1 Main elements of curriculum design.**

The first element to consider in a curriculum design is the source of the design. That is, where should the framework of the curriculum come from? Ornstein and Hunkins (2009) answer with the following: “science as source...society as a source...moral doctrine as a source... knowledge as a source...[and/or] the learner as a source” (p. 183-185). With “science as a source” (Ornstein & Hunkins, 2009, p. 183), curriculum workers rely on observable and quantifiable elements. Drawing a curriculum design from society means to focus on analyzing the needs of society now and in the future. The source of morality refers to designing a curriculum from previous works that outline particular moral guidelines. “Knowledge as a source” (Ornstein & Hunkins, 2009, p. 184) refers to falling back on what disciplines deem the proper way to organize their knowledge. Lastly, the “learner as a source” (Ornstein & Hunkins, 2009, p. 185) refers to evaluating the needs of students as people to design the curriculum (Ornstein & Hunkins, 2009).

A second element to consider in curriculum design is horizontal and vertical organization. Within horizontal and vertical organization are scope, sequence, continuity, integration, articulation and balance. Tyler (1949) describes the scope of design as all the experiences and content that makes up the plan for curriculum. Scope is breadth and depth of material to be covered. It is a horizontal part of curriculum design. On the other hand, sequence

is a vertical component. Sequence refers to the ordering of content overtime. With sequence also comes continuity. Continuity analyzes whether the sequence fits together or not. It looks at the smoothness or absence of topics within a sequence. Another horizontal component, integration, is also considered in curriculum design. This refers to the blending or fusion of disciplines. The possibility of bringing in other disciplines to the curriculum is important to consider. When blending both horizontal and vertical components of the curriculum design, articulation comes into play. Articulation explores the relationships between the horizontal and vertical components. It determines whether the curriculum flows well vertically with the curriculum completed before and/or after the current one being designed. Articulation also refers to exploring the cohesiveness of topics covered among differing curricula. A last component to consider is the balance in the design. It considers if the different skills, knowledge, and attitudes are in balance as to correlate with the defined philosophies. It gives “appropriate weight to each aspect of the design” (Ornstein & Hunkins, 2009, p. 190).

### **2.6.2 Types of curriculum designs.**

Sowell (2005) and Ornstein and Hunkins (2009) define three main types of curriculum designs: subject-centered, learner-centered, and society-centered. Sowell (2005) describes subject-centered designs as “designs that use subject matter as their organizing foci” (p. 55). She comments that teachers and the public are the most comfortable with this design as its use throughout history has been strong. The second major type of curriculum design is the learner-centered design. It designs the curriculum around “students’ lives, needs, and interests” (Ornstein & Hunkins, 2009, p. 197). The third type of design, society-centered, refers to basing curricula on “the needs of society and culture...rooted in the study of life in society, major activities of social life, or social problems” (Sowell, 2005, p. 57). The emphasis in this design is on problem

solving and human relationships rather than content, or on the needs of individual students. The decisions made on particular designs set value judgements for the overall curriculum. For example, a subject-centered design puts value on content instead of personal interest or societal issues (Macdonald, 1971).

Tyler (1949) and Dewey (1938) discuss the importance of pinpointing the educational philosophy before designing the rest of curriculum. Furthermore, Tyler describes how to design a curriculum after both the philosophical and psychological foundations are set. Doll (1986) explains an interesting reality in curriculum design. Rather than starting with philosophical and psychological foundations, then determining objectives from there (also cited in Tyler), Doll comments on research involving two school systems developing curricula. He states that, “Philosophy was ‘on the back burner.’ Curriculum planners touched base with a system of beliefs when they perceived that system to be approved by people in the community who ‘mattered’” (Doll, 1986, p. 182). He explains that philosophies are often overlooked at first and only enter the equation when need be. He suggests a power relationship that exists within curriculum design: the higher-ups in society having a larger influence.

### **2.6.3 Curriculum design as a human construct.**

Henderson and Hawthorne (2000) state that, “The platform design constructed by a group of community members and professional educators provides a vision of the curriculum to be planned and experienced” (p. 82). In other words, the design is the framework of the rest of the curriculum process. Henderson and Gornik (2007) bring up the point that there are “differences in vision and the subsequent problem solving depend[ing] upon the paradigm in which you are situated” (p. 96). That is, different educational contexts produce different approaches to curriculum design. Henderson and Gornik also suggest a curriculum committee be arranged from

a broad range of representatives: “teachers, parents, community members, central office colleagues, students,...and university colleagues (2007, p. 97). They assert that, “We must remember that the members of this committee are equal...These relationships are collaborative” (Henderson & Gornik, 2007, p. 97). People of high socio-economic status are not the only people who can think about curriculum issues (Pinar et al., 1995). This democratic approach to curriculum design leads to another challenge. Democracy means different things to different people, so the committee must be multi-talented in its ideas (Henderson & Gornik, 2007). Sergiovanni and Starrat (2001) state that, “Unless teachers...uncover their platform, they will not establish a base of mutual understanding that is necessary to ground their collaborative effort” (p. 70). This suggests that a team approach is a waste of time if individual differences fight against, rather than enhance, the curriculum design. The process does not stop at simply stating one’s platform. Deliberation must also take place. Henderson and Gornik (2007) make the point that, “It is through deliberating that we make informed and wise curriculum judgements, as opposed to decisions by default based on habits or custom” (p. 99). That is, the default position for failed deliberation is to simply do what has been done before. Dewey (1934) informs us that an educational judgement “demands a rich background and a disciplined insight” (p. 300). The question becomes who determines the background and insight worthy enough to be of value to the curriculum process?

A characteristic of human nature that lives in curriculum design is control. Ilich (as cited in Macdonald, 1971) deems using curriculum theory to inform curriculum design because it is a mechanism of control for larger political systems. He makes the suggestion of de-formalizing the process because of this oppressive element of control. Macdonald (1971) views the subject-centered design as the most influential in maintaining this control system. Second, a learner-

centered design “can most closely be associated with the emancipatory interest” (Macdonald, 1971, p. 291). The learner-centered design implies that an individual’s needs are the central focus. These individual needs are what are valued. This design expresses that individuals have restrictions and they can be freed from these restrictions through “developing individual potential or fostering self-realization” (Macdonald, 1971, p. 291). Last, the society-centered design draws a challenge when different people try to come to a consensus about what social issues are important. The solutions to these problems need not be agreed upon, but the problems at least need to be identified.

This section explored the notion of curriculum design and defines the major types of design. It then explained how design is rooted in human inter-relationships, and how each design says something about what is valued in a curriculum. All of these notions help to understand the human characteristics involved in curriculum design.

## **2.7 Curriculum Development**

The definition of curriculum development is ambiguous. Some authors use the term curriculum development as an over-arching term to describe all the steps involved in making a curriculum. For example, Sowell (2005) defines it as “creating or modifying what is taught to learners” (p. 11). One can assume that this includes all the processes involved in creating a curriculum. Ornstein and Hunkins (2009) describe four realms in producing a curriculum: “design, development, implementation, and evaluation” (p. x-xi). This thesis does use the term curriculum development as an over-arching term for all the steps involved, but deems curriculum development as *one* of the aspects of the entire process. The thesis does not use the term curriculum development as to include curriculum design, implementation, and evaluation, but rather as a separate entity. In this study, the entire process (the collection of steps) is called

curriculum construction. Curriculum development uses curriculum design as a framework. One definition of curriculum development given by Ornstein and Hunkins is used as the definition in this research. They define curriculum development as the “various processes (technical, humanistic, and artistic) that allow schools and schoolpeople [all people involved in schooling] to realize certain educational goals” (Ornstein & Hunkins, 2009, p. 212). This can be accomplished using one or both of the “technical-scientific [and/or] nontechnical-nonscientific approach[es]” (Ornstein & Hunkins, 2009, p. 246).

### **2.7.1 Types of curriculum development approaches.**

#### ***2.7.1.1 Technical-scientific.***

One way to approach curriculum development is using the “technical scientific” (Ornstein & Hunkins, 2009, p. 212) approach. It emphasizes “students learning specific subject matter with specific outputs” (Ornstein & Hunkins, 2009, p. 212). It is a means-ends approach. There is a structure implored in the sequencing of learning activities, materials, and even the way the curriculum design is monitored. It is seen as a complicated arrangement of parts that must be organized into a logical flow in order to foster learning. The view is that the more closely the elements for development are monitored (the means of education), the more tailored the ends of education can be. This is a popular approach in the sciences due to the history of science education. During the early nineteen-hundreds, empirical methods of curriculum development were heavily implored. This is precisely when the three sciences: biology, chemistry, and physics came about in curricula in schools (Ornstein & Hunkins, 2009). Some popular models included in the technical scientific approach are authored by well-known curriculum theorists: Bobbit, Tyler, and Taba.

### ***2.7.1.2 Nontechnical-nonscientific.***

The second way to approach curriculum development is by the “nontechnical-nonscientific” (Ornstein & Hunkins, 2009, p. 220) approach. This approach suggests that the process is “highly objective, universal... logical...subjective, personal, aesthetic, heuristic, and transactional” (Ornstein & Hunkins, 2009, p. 220). It is not the learner’s output that is stressed, but rather the learner themselves. It emphasizes an active rather than passive approach to learning. “Not all the educational goals can be known...[and] the curriculum should evolve rather than be precisely planned” (Ornstein & Hunkins, 2009, p. 220). Stakeholders using a non-technical approach view learning outcomes as not to be measured, but experienced in a humanistic way. The learning is seen as holistic; that is, it cannot be broken down into a series of specific parts. This approach is an evolving approach that deals with complex human interaction between the teacher, student, environment, and self (Ornstein & Hunkins, 2009).

### **2.7.2 Curriculum development as a human construct.**

As with any stage of curriculum construction, there is human nature that influences the process of curriculum development. Macdonald (1971) discusses the three value differences in curriculum construction: “(1) control, (2) consensus, and (3) emancipation” (p. 289). He states that, “It probably matters less whether anyone is pure in interest than whether the theorists know what interests they represent” (Macdonald, 1971, p. 290). He points out a challenge with human nature that makes little difference to curriculum development, and mentions an aspect that seems insignificant (but essential to curriculum development). The act of communicating an idea matters more than being truly passionate about it. If a stakeholder cannot communicate their interest, what is the point in trying to include it in the curriculum?

Marsh and Willis (1996) suggest that, “a combination of specialists and practitioners is desirable...many curriculum development projects have been dominated by specialists and experts” (p. 138). They say that the reason is because of lack of release time to teachers. They also explain that usually the committee is made up of specialists of one kind or another. The specialists are usually people with a wealth of knowledge and experience in education and have some sort of seniority or senior status. Marsh and Willis ask whether these people should be given power in the first place. Or should the power come from a wider range of people? Rogers and Shoemaker (as cited in Marsh & Willis, 1996) explain that the specialists are usually already part of a group with power. The advantage is they have access to resources that others do not. Because of this, “They tend to gain political control of the process of curriculum development. The views of the superordinate group may then dominate decisions about the curricula developed, and these decisions are passed on to the subordinate group, the teachers, who are charged with the responsibility of implementing the curricula” (Marsh & Willis, 1996, p. 139).

Marsh and Willis (1996) also identify the levels of curriculum development: “the national level...state level...school district level...school level...classroom level” (p. 136). Each level is comprised of different types of people. Curriculum development can be tasked to just one level, or a combination of levels.

Marsh and Willis (1996) describe some of the main goals that curriculum developers may have in mind. The first is that curriculum developing activities “are designed to maintain and reinforce existing syllabi, resources, or practices” (Marsh & Willis, 1996, p. 136). One reason for this is the curriculum is fine the way it is, but just needs updating. Another reason is “time constraints or the political climate are such that nothing more than slow, gradual change is likely to succeed” (Marsh & Willis, 1996, p. 137). Another main goal is that the curriculum developing

activities “are predominantly speculative...[They are] ‘think-tank’ approaches to possible future curricula” (Marsh & Willis, 1996, p. 137). That is, the goal of the curriculum committee is to develop new activities for future use. Marsh and Willis comment that few curricula are developed this way because the goal is for future curriculum. A last goal they mention is that the activities are “designed to produce innovative curricula and concrete experimentation” (Marsh & Willis, 1996, p. 136). This goal falls between the first two. In this case, a new and innovative curriculum is created, and real, concrete programs are introduced.

Paris (as cited in Marsh & Willis, 1996) claims that only classroom teachers should be developing curriculum because of their experience directly with students. A curriculum construction committee of this kind would consist of a group of teachers working in that subject. Marsh and Willis (1996) question whether this is appropriate. They bring up four important points. The first two points ask if a typical teacher has the enough knowledge of the subject area and a comprehensive understanding of developmental levels of students. In this province’s context, it seems that chemistry teachers would have these for the most part. On the other hand, Marsh and Willis mention two other points that are less likely in this case study’s province. The points are if a typical teacher has “an understanding of the skills involved in [1] designing a curriculum...and [2] develop[ing] policy statements” (Marsh & Willis, 1996, p. 139).

Marsh and Willis (1996) discuss two ways curriculum projects are undertaken: “generic and site-specific” (p. 140). The “generic” (Marsh & Willis, 1996, p. 140) refers to a broad range of curriculum developed for a particularly larger region. Usually it is developed by large teams of people, experts in their fields. They survey to determine a needs assessment, and their activities are constantly monitored and reviewed (Marsh & Willis). On the other hand, “site-specific” (Marsh & Willis, 1996, p. 140) refers to curriculum development that takes place on a

smaller scale. They usually consist of small groups of teachers, working on the project on a part-time basis. The needs assessments are often brief and informal. The focus tends to be on the production of materials rather than developing overall philosophies (Marsh & Willis, 1996). A curriculum can be produced from aspects of both. The human dynamics involved in each type are complex. It becomes even more complex when the two types are blended together. It raises many questions of the human dynamics that are involved. Which voices come out strong? Which voices are marginalized? Which ideas are accepted and which are tossed aside and why?

In this section, curriculum development was defined in terms of a separate realm of curriculum construction. The types of curriculum development were discussed, drawing connections to curriculum design. Lastly, human interactions that affect the curriculum development were brought up to connect curriculum development to the overarching theme of this thesis: curriculum as a human endeavour.

### **2.8.1 The Influence of Stakeholder Foundations/Orientations on Curriculum Design and Development**

As discussed in Chapter One, a wide range of curricular foundations/orientations can be represented in a written/formal curriculum, which is what makes it a “marble cake” (Bell, Carr, & Jones, 1995, p. 99). A stakeholder, within their own being, potentially holds a medley of foundations/orientations that seek to influence the curriculum construction process. As more people are involved, this medley expands and becomes even more complex. In this section, the relationships between the various foundations/orientations and types of design and development are discussed. For example, certain philosophical or psychological foundational perspectives are associated with certain types of curriculum designs. Stakeholders hold certain views on what the foundations/orientations of a curriculum should be. This, in turn, affects the design and

development ideas they choose to apply (whether knowing it or not). Connelly and Clandinin (1988) comment that, “It is important that we [teachers] know and understand the various stakeholders and their stakes...so we can be appropriately responsive” (p. 124). In order to best serve students and society, the stakes of stakeholders need to be identified.

From the literature given above (that discuss each of the foundations, orientations, design, and development ideas), there are some obvious relationships. Table 1 below displays some of these relationships. It is not an inclusive chart of all the ideas of each entity, but it shows common ideas between them. There is overlap between entities, as each is not restricted to its own definitive box. The overlap is not represented in the table as to keep the main relationships clear and simple. Furthermore, each entity could be matched with other entities that are not represented in the table. Again, these are main relationships identified in the literature review above.

Table 1

*Main Relationships Between Foundations, Orientations, Design, and Approaches to Development of Curriculum*

	Foundation			Orientation	Design	Development
	Philosophical	Historical	Psychological	Social		
perennialism	-	-	behaviourism	-	academic rationalism, social construction, curriculum as technology	subject-centered technical-scientific
essentialism	-	-	cognitive psychology	-	academic rationalism, development of cognitive processes	subject-centered technical-scientific
progressivism	-	-	cognitive psychology	-	personal relevance	learner-centered technical-scientific
reconstructionism	-	-	phenomenology	-	social reconstruction	society-centered nontechnical-nonscientific

### **2.8.2 The Influence of Context on Curriculum Design and Development**

Grumet (as cited in Pinar & Reynolds, 1992) explains that, “Whenever we speak of education, we are speaking of a person’s experience in the world. Despite the unique specificity of each person’s perspective, the intentionality of all conscious acts focusses our gaze on some object, real or imagined; we exist always in context” (p. 29). This explanation is quite insightful. It explains that each person’s view of reality (and even the imaginary world) is constructed from experiences that are situated in some sort of context. The context can be a place, situation, mood, or circumstance (or a combination of these) that helps contribute to that human construction. In the case of a stakeholder building a curriculum, they exist in some context that will majorly effect the decisions they make about a curriculum. The following discussion starts by exploring general contexts and then leads to more specific ones.

Firstly, stakeholders are “buffeted by strong educational, social, and political forces affecting the curricular decisions they must make” (Olivia, 1997, p. 482). Olivia (1997) makes a general remark about the major elements of a stakeholder’s context. Those elements ultimately affect the decisions they make. Going further, Glattorn, Boschee, and Whitehead (2009) comment that the “struggle for power in the curriculum-making process seems to occur most stridently at the federal, state, and local district levels and differentially, in some cases positively, affects the...written curriculum” (p. 109). The authors focus on the politics of curriculum, pinpointing specifically which levels dynamically influence the curriculum construction process. At any given time, a stakeholder can find themselves at any of these levels. Within each of these, there are other multitudes of influences that permeate the stakeholders’ decisions. Going even smaller than local district levels, “Curriculum decision makers-teachers, principals, and administrators—do not operate in a vacuum, since they are influenced by many other individuals

and groups” (Marsh & Willis, 1996, p. 309). The authors explain the extent of these influences can be small (unofficial meetings) to large (mass media influence). Influential individuals or groups can have a particular agenda to get across like including certain topics or particular points of view in a curriculum. Another concern can be the type of language used in the curriculum, or certain slogan use. Some people may want to influence the way the curriculum process runs, or the specific content to be included (Marsh & Willis, 1996).

### **2.8.3 Human Tensions/Deconstruction Processes in Design and Development**

The differing viewpoints and contexts that stakeholders bring to the table inevitably produce tensions. These tensions can occur in a variety of forms. For instance, tensions can occur between two stakeholders with opposing views on a curricular issue, or a stakeholder can experience tensions within their own thoughts about curriculum. In either case, stakeholders must internally adjust their own views in order to reach some sort of consensus among other stakeholders. Consensus must be reached in order for a new curriculum to be realized. Macdonald (1971) states that, “Curriculum thinking [has] such a diverse and circular character... We are... talking at different value levels... [but assume] that we all [share] the same basic perspective” (p. 285). In order for stakeholders to come to some sort of consensus, individuals have to adjust. Sowell (2005) agrees that, “curricular change occurs only after *individuals* have made internal transitions. That is, people must ‘end the old’ before they can ‘begin the new.’ Transitions take time, understanding, and support on the part of all of the people involved” (p. v). Sowell suggests that some sort of deconstruction process takes place in order shake previous beliefs and emerge to a new level.

Doll (1986) explains some of the mechanisms of this change. Drawing from social science, he explains that change happens in three steps. The first step is “initiation,” (Doll, 1986,

p. 268) in which the new ideas are fabricated. The second step is “legitimation, in which the sentiment on behalf of change is communicated” (Doll, 1986, p. 268). The third step is “congruence” (Doll, 1986, p. 268) which aligns the values of the person affecting the change with the person being affected by the change. First, he explains that there is something within the individual that feels the need for something different. This need is met by some sort of experience. Because of this experience, the person sees themselves with a new lens. This new lens results in new values, which now are a part of the individual (Doll, 1986). Doll follows up this explanation with some summary points. The points pertaining to improving the curriculum process are: “[1] The direction of improvement should be determined cooperatively...[2] People must identify and examine each other’s centrally held values...[3] People improve through experiencing...[4] People’s resistance to efforts of others to help them improve constitutes a major individual difference...[5] Stimulators of improvement should help keep channels of communication open...[6] Stimulators of improvement should use their power and influence with great care” (Doll, 1986, p. 270-271). Doll explains some of the aspects of a deconstruction process that takes place within an individual in order to achieve change. There is limited literature that investigates *understanding the nature* of these processes in terms of curriculum construction. That defines the need for the research outlined in this thesis.

## **2.9 Chapter Summary**

The first section of this literature review discussed the amorphous definition of curriculum. It then explained the types of curriculum involved in this study. From this, it moved on to describe the dynamic human nature of curriculum construction. The second part of the literature review explained four major foundations to curriculum (Ornstein, 2009), and five major curricular orientations (Eisner, 1979). The third part of the literature review described the

elements of curriculum design and development and the human aspects involved. The fourth section of the literature review discussed the influence of stakeholders and context on design and development of curriculum. The last part of this section investigated the human tensions and deconstruction processes created because of stakeholders and context.

The literature review gave a comprehensive background to investigating the research questions in this thesis. It gave context for the questions and explained the various elements involved in the construction of curriculum. There is no literature that studies the human nature of curriculum construction in this case study's province specifically. Specifically, there is also no literature that studies the construction of this particular *Provincial Grade 12 Chemistry Curriculum Framework* (2013) curriculum document. The chapter that follows will describe the methodology and methods that will be used to answer the research questions posed for this study pertaining to the construction of the *Provincial Grade 12 Chemistry Curriculum Framework* (2013) written/formal curriculum.

### Chapter Three: Methodology

#### 3.1 Introduction

The focus of this thesis is to understand that curriculum construction is a product of human dynamics. The study investigates the nature of these human relations in terms of the events that occurred in the curriculum design and development of the *Provincial Grade 12 Chemistry Curriculum Framework* (2013). It delves into the various participants' lived experiences. Because each participant brings different ideas and backgrounds to the table, the curriculum team likely creates a curriculum that is a "marble cake" (Bell, Carr, & Jones, 1995, p. 99) of different foundations (Ornstein & Hunkins, 2009) and orientations (Eisner, 1979) of curriculum. The biasing of different foundations and orientations creates tensions in the curriculum process, which in turn, may cause stakeholders to rethink their original purposes. It may cause stakeholders to deconstruct their original views and reconstruct new ones.

The literature discussed many influences that permeate and influence the curriculum construction process. Most of the literature discussed this in general terms. There is no literature identified that has researched curriculum processes from a human dynamic perspective in this case study's province. This research is needed to understand the dynamics of curriculum construction, in this study's case, in the recent provincial Chemistry curriculum. The true human motivations behind the text of the Grade 12 formal Chemistry curriculum document must be revealed. People who are subject to work with this document are "entitled to know a fuller explanation of the curriculum developers' knowing stance and interest" (Aoki, 1978, p. 414).

This brings us to the research questions pertaining to the case study of the construction (design and development) of the *Provincial Grade 12 Chemistry Curriculum Framework* (2013) written/formal curriculum document. The need for this research comes out of the non-existent

literature that studies curriculum construction processes in the province in which the case study was conducted. The goal of this research is to understand the dynamics of the design and development of the Grade 12 Chemistry curriculum. All of the research questions are within the context of the construction (design and development) of the *Provincial Grade 12 Chemistry Curriculum Framework* (2013) curriculum document (called the written/formal curriculum).

The general research question is:

What were the human dynamics involved in the design and development of the *Provincial Grade 12 Chemistry Curriculum Framework* (2013) written/formal curriculum document?

The specific research questions are:

- (1) What were the main factors that influenced the construction of the document?
- (2) What were the lived experiences of the stakeholders involved in the construction process from conceptualization through to implementation?
- (3) In retrospect, how do the stakeholders look back at the process and the product?
- (4) What is the nature of any deconstruction and/or reconstruction processes the stakeholders experienced?

Research question one asks what the influences were on the curriculum document? The intention of this question is to reveal the story behind the design and development process specifically. There are many factors that influence any curriculum document. Specifically, I want to know what the *main* influences on the Grade 12 Chemistry curriculum were. Research question two investigates the stories of the stakeholders themselves as people with varying backgrounds, ideas, and values. The stakeholders brought all of these to the table while designing and developing the curriculum. The essence of this question is to draw out any

tensions that occurred during the process. It investigates the significant events that happened between the actual people involved in creating the curriculum. Rich descriptions of these dynamics were recorded. Research question number three shifts to an inward focus. It examines the personal thoughts of the stakeholders as individuals involved in the process. It is meant to draw out feelings about the process as a whole, rather than explain specific events like in research question two. Furthermore, research question three investigates if the stakeholders feel their ideas were represented in the final document. It also investigates any possible missed opportunities in the process. It is a retrospection of their overall experience in the process. Research question number four draws upon the answer from question three. Question four investigates the nature of any processes of deconstruction and/or reconstruction that the stakeholders experienced. That is, did the stakeholders disassemble their previous notions of chemistry education during the process and reassemble new ones?

### **3.2 Philosophical Assumptions and Interpretive Frameworks**

There are certain philosophical assumptions associated with this qualitative inquiry that are important to identify. First, the ontology (nature of reality) is that the representation of different realities from the curriculum construction came from many different peoples' perspectives. There were different stakeholders in the curriculum construction process that had different views as to what happened during the process. There was not one universal "way that it occurred," but rather a complex reality formed from the many people involved. Second, the epistemological assumption (what is knowledge?) is that the subjective evidence from the participants counts as knowledge. That is, the fact that the participants experienced the events first hand justifies that what they shared is worthy knowledge. I, the researcher, relate to the individuals in that I implement the curriculum they referred to. Third, the axiological assumption

(what are values?) is that I have biases and so do the participants. As the researcher, I interpreted the data from others and presented it as raw data, although it went through my own filter (filled with assumptions and biases). It was important to be mindful of this and identify my own biases beforehand. An important bias is that I have never helped design or develop a curriculum, so my assumptions about the process were purely theoretical. I have no practical experience to relate to. A second major bias is that I have developed more of a social reconstruction curricular orientation, which may have led me to draw this out in the document analysis portion of this research. I had to make sure to interpret the document as it is, and to not lean on my own biases of what I thought it *should* say. Last, the methodological assumption is the emerging design of this study. The information was built from the bottom up based on the data as it was collected. I had to be flexible in terms of what the data was telling me rather than trying to fit it into a theoretical box. I did not take theories and apply them, but rather used them to inform and interpret the realities constructed by the participants (Creswell, 2013).

The philosophical assumptions presented above led to a certain interpretive theoretical framework that applies to this research. This framework is social constructivism (or interpretivist). I relied as much as possible on the views of the participants. These views were formed from the interactions with individuals. These views were formed from the interactions with other stakeholders and also interactions with me as the researcher. They were socially constructed. The goal is to reveal an understanding of the world in which the participants live and work. These views are varied and multiple, and therefore reveal a complex network of relationships. I made an interpretation of the data through my own background and history. It is my intent to make sense of the curriculum construction process in this particular context (the

Grade 12 Chemistry curriculum) through the meanings revealed by the participants (Creswell, 2013).

### **3.3 Context of the Study**

The curriculum construction process for the *Provincial Grade 12 Chemistry Curriculum Framework* (2013) written/formal curriculum document started in 2002, with an unedited draft document released in 2004. It involved twenty-five people in total, fifteen of which were directly involved. There were two principal writers, one of which also served on the development team (which consisted of nine people total). There was one post-secondary advisor. There were thirteen people listed from Provincial Education, ten of which were part of the School Programs Division and three as a part of the Bureau de l'éducation française Division staff. The English document was released both online and as a printed copy. The French document has yet to be released. The document itself consists mostly of written text. The learning outcomes are mandated by the province to be implemented as the Grade 12 Chemistry course (Provincial Education, 2013). The document states that, "The learning outcomes are the same for students in the English, French Immersion, Français, and Senior Years Technology Education Programs, and result from a partnership involving two divisions of Provincial Education: School Programs Division and Bureau de l'éducation française Division" (Provincial Education, 2013, p. 1). This is the formal/written curriculum mandated by Provincial Education for students to receive credit for Grade 12 Chemistry throughout the entire province. Students who take this course require the pre-requisite Grade 11 Chemistry course. The Grade 12 Chemistry is the general Chemistry course that students can take in the province. Other Chemistry courses available include the Advanced Placement Chemistry and the International Baccalaureate Chemistry. It is important to note that these two advanced courses are only offered at select schools, whereas the Grade 12

Chemistry is offered at most schools around the province. It is also significant that there is no standards test in chemistry implored by the province, or any other level of government. Unless mandated within a school division or within a specific school, the teacher has sole discretion as to the assessment and evaluation methods used in determining student's achievement.

### **3.4 Research Design**

The research design is a case study. The case studied was a bounded system. It was bounded by the time frame in which the design and development process occurred and in the context of the construction of the *Provincial Grade 12 Chemistry Curriculum Framework (2013)* written/formal curriculum document. The final document has been published and released, so the process of design and development has ended. This is a study that investigates the characteristics of a process that has been completed. It is a descriptive case study, in which I provide rich details of the case and report emergent themes from interacting with the data. The goal is to provide an in-depth understanding of the human processes involved in the creation of the *Provincial Grade 12 Chemistry Curriculum Framework (2013)* curriculum document. This is a single “instrumental case study” (Stake, as cited in Creswell, 2013, p. 99) where multiple sources of information were used to create the description of the case. I used both document analysis and interviews. I focussed on one concern (the human dynamics involved in curriculum construction) and selected one bounded case (the design and development of the *Provincial Grade 12 Chemistry Curriculum Framework (2013)* curriculum document) to illustrate the issue. This case involved the perspectives of many people in the production of one official document. The people were interviewed and the curriculum document analyzed.

### 3.5 Data Sources

A first source of data was the *Provincial Grade 12 Chemistry Curriculum Framework* (2013) curriculum document. This is a public document readily available online and in print. The second source of data was the stakeholders involved in the development of this curriculum document. Contact was established with all fifteen stakeholders that were heavily involved. This was determined by the snowball sampling method (detailed in the next section). Out of the fifteen people that were contacted, eight participated in the study. They were each interviewed. The eight people gave a representative sample of the subcategories listed in the “Acknowledgements” (Provincial Education, 2013, p. vi-viii) section of the curriculum document. I do not reveal the numbers of participants from each category in order to preserve anonymity because some subcategories have only one or two people listed in that role. If the subcategories were revealed, then those people would be immediately identified.

### 3.6 Participants

The participants are people of varying age and experience in the field of education. They participated for varying lengths of time during the development process. The specifics of these times were not detailed here in order to preserve anonymity. Because the document lists the dates to which each stakeholder was involved in the process, revealing that information here would have identified them immediately.

In the *Provincial Grade 12 Chemistry Curriculum Framework* (2013) curriculum document, it lists the stakeholders involved in the curriculum construction process (p. vii-viii). The people are listed under certain subcategories such as: “Principal Writers...[and] Members of the Development Team” (Provincial Education, 2013, p. vii). I have used representative sampling by choosing stakeholders that represented different subcategories of teams in the list

provided in the curriculum. The goal was to obtain an array of perspectives about the curriculum construction process. On the other hand, I did not keep a rigid focus on providing an accurate proportioned representative sampling of the different sub-teams of stakeholders (more applicable in quantitative sampling). Instead, I chose stakeholders that provided rich insight into describing the human nature behind the construction process (more applicable in qualitative research).

The method used to select individuals for interviewing was purposeful sampling. Of purposeful sampling procedures, I used criterion sampling. The criterion for selecting stakeholders was selecting individuals who (a) were involved in the process for any amount of time, (b) willing to share their experiences and reflections about the process. The reason for criteria (a) was to gain multi-representative viewpoints of the curriculum construction process. People involved in the process for a long time had a comprehensive view of the process. Furthermore, people who were involved in the process for a short time also had insightful information. The collection of viewpoints represented a holistic, comprehensive view of the dynamics of the process.

Third, I used snowball sampling as well. I started by interviewing a few participants and asked them to recommend other stakeholders involved in the process that could provide me with rich descriptions of the human dynamics involved in the process. For example, the role of a particular stakeholder on the list may just have been to provide an official stamp of approval for the publication of the document. In turn, they may have had little influence on its design and development. Although they are one representative of a certain sub-team, they would have provided no further description of the theme of the thesis. The first stakeholders I interviewed had knowledge of the influence of other stakeholders. They forwarded an “Information for

Possible Participants Form” (see Appendix E) to the suggested stakeholder, and if interested, the new stakeholder contacted me, the researcher.

### **3.7 Data Collection**

The methods I used provided the data I needed to answer the research questions. I conducted one in-depth interview with each of the participants (there were eight participants interviewed). Eight participants provided a comprehensive, multi-perspective description of the case.

In a way, each interview is its own case study, within a larger case study of the curriculum construction process (design and development from start to finish) for the *Provincial Grade 12 Chemistry Curriculum Framework* (2013) curriculum document. Furthermore, each interview has a phenomenological nature to it as well, describing the lived experiences of the stakeholders during the curriculum process. All participants experienced the same phenomenon, but had different roles and perspectives. A participant’s remarks were their own personal view. A participant may give an inaccurate representation of an event according to other participant viewpoints, but this does not make the viewpoint invalid.

The interview questions were crafted in a way that was not leading. Although the focus was on more interesting aspects of human nature (tensions involved, potential power relationships, etc.), I did not want to phrase the questions so it would lead the participants down this path. I used semi-structured interview questions (see Appendix A). The questions had an overall focus on human relationships, but also were kept open-ended to allow for elaboration or other interesting aspects to emerge. The interview questions (see Appendix A) were structured in a way to address each of the research questions. Some of these questions were asked directly in the interviews, but some people gave a chronological account of their experiences.

These questions focussed on providing answers to the research questions. Interview questions one to five asked about background information of the participants. Although not included in the data, due to confidentiality concerns, they provided a sense of each participant's educational context. It set a context for the perspective revealed in the remaining questions. The answer to question six revealed the reason why a new curriculum was initiated in the first place. Again it addressed the human constructs that were at play during this stage. Question numbers seven through ten described the views and values of each stakeholder, as an individual. That is, their position before entering the curriculum construction process. It gets to the heart of what they deemed as important in chemistry, whether they were able to communicate this during the process, and whether their ideas were taken seriously. Questions eleven to fourteen asked about human relations between stakeholders as individuals and how their ideas differed or were similar to other participants' views. Questions fifteen to twenty-one asked directly what the main influences were on the curriculum. They also were designed to draw out any tensionality due to these influences. Question numbers twenty-two to thirty investigated the participants' views on the process as a whole. Lastly, questions thirty-one to thirty-four asked about if their views about chemistry education changed as a result of the process. These questions were designed to investigate how the participant signified this change (if one occurred at all). More about how these interview questions were designed to answer the research questions is examined in the Data Analysis section.

A paper copy of the actual *Provincial Grade 12 Chemistry Curriculum Framework* (2013) curriculum document was available for the participants to refer to during the interview. Because the participants were involved in the curriculum construction process for a long period

of time (about nine years), having the actual document during the interviews helped jog specific memories of experiences they had.

I accessed participant contact info by looking up the participant's contact information online. I went to the person's workplace (or other mutually agreed upon location) to conduct the interviews to get a better sense as to their educational context. In my thesis, I am purposely prudent not to reveal this information in the data to avoid compromising confidentiality.

I sent out an e-mail which explained the nature of the study and the interview questions (see Appendix A). When interest was confirmed, I provided a paper copy of the consent form that the participants signed on the day of the interview (see Appendix C).

Before finding participants, I obtained ethical approval from the Education/Nursing Research Ethics Board (ENREB) (see Appendix F). Consent was obtained in writing. All participants were told that their participation is voluntary and that they may withdraw from the study at any time without any consequences or repercussions, simply by telling me.

On the consent form, interviewees were provided with the opportunity to request whether or not they would like a summary of the study once this research was completed. For those who wished, separate contact information was logged, separating the contact information from the consent forms. On the consent form, I asked the participants if they were willing to be contacted for further questions after the initial interview if needed. I kept their contact information in a separate location from the data, results, and analysis. I keep it in a locked office that only I, the researcher, have access.

In the data presented, I did not use pseudonyms, or write the date of the interview in the reference. This was done to increase anonymity. The data is presented in an aggregated form, mixed up, with the reference "(Participant, personal communication, March, 2014)." Because

each reference is the same for all participants, it is difficult to tell who said what, even though the development team consisted of a small group of people. Furthermore, there is no reference made to the specific Canadian province in which this case study is located. The reasoning is again to increase anonymity of the participants. The actual provincial document names were not revealed in any of the in text quotations, paraphrasing, reference tags, or in the references list. The document that this case study explores is referred to as *Provincial Grade 12 Chemistry Curriculum Framework* (2013). There are also references to the previous curriculum document which is referred to as the *Provincial Grade 12 Chemistry Transitional Curriculum Framework* (1998). Transcriptions were made immediately after interviews. Member checks were performed. A direct benefit to the participants was the opportunity to receive feedback about the study results, including other perspectives about curriculum construction process.

### **3.8 Ethical Considerations**

This study produced no serious ethical problems. On the other hand, there were small considerations to address.

First, there was an ethical consideration about revealing the identities of the participants. Because all the participants worked together on a large project, many of them probably knew each other quite well. They may have been familiar with each other's mannerisms, figures of speech, and backgrounds. Reading the results of this study may enable participants to identify other participants involved. I overcame this by explaining this concern to the participants before the interview. Questions one to five were intentionally left out of the data reporting in order to preserve anonymity. I was frank in stating my concern, plus the concern was explained in all of the correspondence: the Participant Recruitment E-mail (see Appendix B), the Research Participant Information and Consent Form (see Appendix C), and the Information for Possible

Participants (see Appendix E). The challenge was compromising the richness of data that could have been obtained because of the chance that participants could be identified by others or each other. Participants were less willing to talk about their tensions or any power relationships if they thought there was a chance of being identified. The steps described above were taken to avoid this.

A second ethical consideration was that my advisor for this thesis may have been one of the participants interviewed. Because of this, his influence on the analysis of data may be biased to his thoughts about the case being studied. On the other hand, he represented (if included in the data) one sub-team within the entire curriculum construction team that may have had a large influence on the curriculum design and development. Another point is that he was the only member of the sub-team, the “Post-secondary Advisor” (Provincial Education, 2013, p. vii). If he decided to participate, I warned him about the nature of questions one to five. If he decided to participate, I reminded him (along with other participants) that they can change their answers at any time, or opt out of this research, with no repercussions. My advisor did not have access to any transcripts and all analysis and interpretation was done independent of his participation.

### **3.9 Data Analysis**

The answers to the research questions emerged from the data analysis. There are two main analyses that took place: analysis of the curriculum document itself, and analysis of interviews from the stakeholders.

Research question one (what were the main factors that influenced the construction of the document?) were answered by both document analysis and analysis of the participant interviews. The curriculum document was analyzed by using the theories explained in the literature review: foundations of curriculum (Ornstein & Hunkins, 2009), and orientations of the curriculum

(Eisner, 1979). I analyzed the wording within the text of the curriculum document to reveal the different foundations/orientations represented. I analyzed both the introduction section of the document (where it explains general philosophy and general learning characteristics) and the rest of the document (where it outlines specific learning outcomes and its associated content (for example, a specific learning outcome with its associated learner tasks or suggestions for instruction)). Both sections revealed text that was related to the foundations/orientations of curriculum. Recurring themes revealed the main influences on the curriculum.

Research question one was also be informed by the answers given in the interviews. I still used the foundations/orientations as a lens for analysis for the participant answers for interview questions seven and eight. This revealed each participant's view as to which foundations/orientations they preferred and brought to the curriculum construction process. These then ended up being influences of the curriculum construction as well.

Research question two was answered by analyzing interview questions eleven to twenty-one. I analyzed perspectives on these experiences by drawing themes out of the data. Data was coded and a "within-case analysis" (Creswell, 2013, p. 101) was applied. Commonalities among lived experiences among participants were examined. I then sought to construct meaning from those themes, again focusing on the human dynamics that played out in those experiences.

Research question three was answered by questions twenty-two to twenty-nine. Again, data was coded and themes drawn out to describe the varying perspectives about the curriculum process, when stakeholders reflected on their experiences.

Research question four was answered in questions thirty to thirty-three. Again, rich descriptions of any reflective deconstruction/reconstruction process were analyzed by coding and theming.

In summary, interview transcripts were analyzed and themes drawn out. I wrote up each case chronologically and individually. I cross-case analyzed the interviews (in terms of each interview being a mini-case within the large case of the curriculum construction process) to reveal resonance and discordance.

### **3.10 Validity**

The findings were validated by triangulation, rich thick description, and member checking. First, triangulation was demonstrated by collecting data from multiple sources. I had a document to analyze and many interviews to analyze. Second, member checking confirmed information revealed in the interview. Third, rich thick descriptions allow for readers to make decisions regarding transferability. Each reader can better make that decision through the accurate and detailed descriptions of the case being studied.

### **3.11 Limitations**

One limitation is that the conclusions made in this study are not generalizable. Following on from this point, it reveals only some of the human dynamics that may occur in other curriculum construction processes. This is for the reader of this research to decide within their own context. Another limitation is that I did not interview every person involved in the curriculum construction process. This left out potentially influential perspectives that could change the dynamic of the results of this study. Third, because the curriculum construction process is over, I could not gather data from more sources, other than interviews and the document itself. For instance, I could have made observations during the process. A last limitation is positioning me, the researcher, in this research. Due to my inexperience with curriculum design and development (I have never been involved in making a formal policy-driven curriculum before); it was difficult for me to relate my own experiences to the

experiences of the participants. I have my own biases about the process that have never been realized or counteracted. On the other hand, I hope that this inexperience gave me an advantage of viewing the data from more of an impartial view that does not favour certain perspectives.

### **3.12 Timeline**

I proposed my research study in January, 2014. I submitted an ethics proposal immediately after approval (December/January). I began establishing contact with participants and collecting data in February. Data analysis, Conclusions, and the Discussion were completed in June. I defended the finished thesis in August, 2014.

### **3.13 Chapter Summary**

The setting, participants, document, and methods I used were appropriate for answering the research questions of this study. The analysis techniques sought answers to the research questions proposed. The construction of the *Provincial Grade 12 Chemistry Curriculum Framework* (2013) written/formal curriculum document is indeed a human construction. The document was analyzed and people were interviewed. That revealed varying degrees of perspectives. This is due to the varying values and backgrounds that the participants hold. This Methodology chapter discussed the philosophical assumptions and interpretative frameworks, the context of the study, the research design, data sources, information about participants, data collection and analysis, ethical considerations, aspects of validity, inherent limitations, and timeline of this research. The next chapter reveals the data obtained by the implemented methodology explained above.

## Chapter Four: Data Collection/Data Analysis

### 4.1 Introduction

This chapter presents information from government documents outlining the general curriculum development process in this case study's province, and also analyzes the case study curriculum document at hand: the Grade 12 (2013) Chemistry curriculum. In the next section, 4.2, an overview of the process that the province uses for its curricula development is outlined. This sets an overview of guidelines that the 2013 Chemistry curriculum would have followed in its development. Section 4.2.1, details how the province structures curriculum development teams that are developing new curricula. This is important to include because it provides an understanding of the model that the development of the 2013 Chemistry curriculum would have used. After the general structure of the curriculum development process is outlined in 4.2 and 4.2.1, section 4.3 examines the structure of the specific curriculum document: the *Provincial Grade 12 Chemistry Curriculum Framework* (2013). This gives a general oversight of the different sections of the specific curriculum document itself. Section 4.4 then moves into the document analysis. Because the 1998 transitional curriculum was just that, a transition into the 2013, section 4.4 reports an analysis of both the 1998 and 2013 curricula. It is essential to understand where the 2013 came from due to the historical nature of curriculum development in the province. First of all, the main similarities and differences between the two curricula are identified in 4.4.1. Then, in order to understand and analyze the 2013, the main underpinnings of the 1998 transitional must be understood beforehand. In this regard, 4.4.2 identifies the main theories and foundations that underpin the 1998 curriculum. Conversely, section 4.4.3 identifies the theories and foundations of the 2013 curriculum, mainly from analysis of the introduction (first half) of the curriculum document. Section 4.4.4 compares and contrasts the learning

outcomes in the 1998 and 2013 documents. The remaining sections of the chapter focus solely on the 2013 document. Section 4.5 provides an analysis of the specific learning outcomes and the content associated with each, found in the 2013 document. This is an analysis of all the parts found in the second half of the document, not just the specific learning outcomes. The relationship between the information presented in sections 4.4.3 (foundations/theories in the introduction (first half)-of the 2013 document) and 4.4.5 (foundations/theories in the specific learning outcomes (second half)-of the 2013 document) is presented in section 4.6. In turn, section 4.6 explores disconnect between the introduction (first half) and specific learning outcomes and associated content (second half) sections of the document.

#### **4.2 Overview of the Provincial Curriculum Development Process**

This section outlines the typical curriculum development process that the province uses for all of its curricula. As described on the Provincial Education (2014) website, “In developing curricula, [the province] follows a consistent process” (Development Teams section, para. 1). That is, the development process for any curriculum in the province uses the same procedure. The reason for including this information as a part of this thesis is to understand the official process that guided the construction of this case study, the *Provincial Grade 12 Chemistry Curriculum Framework* (2013) curriculum document. This thesis then investigates the human dynamics that interplay within this overarching framework. That is, what happens to this fairly clear process once human experiences, backgrounds, and personalities are introduced? What happens to a linear process once non-linear human entities are introduced? The following outlines the process and also provides a quasi-analysis in order to highlight important points about the process that relate to the data analysis of the specific case study of the *Provincial Grade 12 Chemistry Curriculum Framework* (2013) document.

“The goal of the curriculum development process is to develop curricula that compare favourably with those of other leading countries” (Provincial Education, 2014, Curriculum Development Process section, para. 1). This is an overarching goal as to the point of curriculum development in the province. Its goal is to make sure the province is on-par with other provinces and first world countries. The main goal does not mention aligning the values of the province with what students should be learning in school. One can interpret this over-arching goal as to include this suggested reason, but without being explicitly stated, it can be difficult to make this connection. The curriculum development process also calls upon “the focused participation of educators, scholars, industry representatives, and other community members with relevant expertise” (Provincial Education, 2014, Curriculum Development Process section, para. 2). That is, an important aspect of the process claims to reflect proper representation from the school system, academia, business, and other groups connected to the subject field. The description of the curriculum development process makes reference to a broader outside body that links other provincial ministries of education within Canada. The process favourably includes the work of the collaboration of these ministries of education in the *Western and Northern Canadian Protocol (WNCP) for Collaboration in Education, K-12* and the *Pan-Canadian Science Project*. They both focused on the core subjects (mathematics, language arts, social studies, and science) (2014, para. 3).

#### **4.2.1 Structure of the development teams in the province.**

The curriculum development process document then describes a series of teams that are involved in the process: “curriculum development teams, review panels, field validation, authorized provincial use, [and] continual updating” (Provincial Education, 2014, Development Teams section, para. 2). The curriculum development team is comprised of a “departmental

project leader/specialist, a qualified writer(s), and exemplary classroom teachers and scholars” (Provincial Education, 2014, Development Teams section, para. 3). It is interesting to note that within the goal of the curriculum process, it states to include representation of “educators [and] scholars” (Provincial Education, 2014, Curriculum Development Process section, para. 2), which are included in this team, but the “industry representatives, and other community members with relevant expertise” (Provincial Education, 2014, Curriculum Development Process section, para. 2) are not listed as specific members to make up the development team. This is a major inconsistency with the goal of curriculum development in the province and the process set up to meet that goal. On the other hand, later in the document it describes that the team members “receiv[e] and assess information from educational partners such as scholars, industry representatives, parents, and educational organizations and associations” (Provincial Education, 2014, Development Teams section, para. 5). In turn, the input from business and other community members is there, but through the filter of the teachers, scholars, and department leader. Ultimately, the business and other community member influences can be ignored, or left unheard because the team members have the decision-making power to pick and choose what ideas to include and not include.

The document also describes how the curriculum development team members are selected. The Department of Education sends out letters to “Superintendents of Education of provincial school divisions/districts, to Principals of Independent schools, and to Directors of Education and Principals of First Nations schools, requesting nominations of teachers to serve on the development team” (Provincial Education, 2014, Development Teams section, para. 4). The nomination forms require the teachers to have a variety of skills such as curriculum design knowledge, and exemplary classroom practice (Provincial Education, 2014). Other requirements

include “geographical representation, gender balance, multicultural and Aboriginal representation” (Provincial Education, 2014, Development Teams section, para. 4).

The document then outlines the responsibilities of the development team. They are responsible for:

Gathering and coordinating all relevant research (e.g., curricula in other jurisdictions, subject area/course content, learning theory, and evaluation tools), receiving and assessing information from educational partners such as scholars, industry representatives, parents, and educational organizations and associations, developing and writing documents, taking into consideration all relevant research, expertise, and departmental requirements, [and] revising/evergreening curricula (Provincial Education, 2014, Development Teams section, para. 5).

The process then describes a review panel team. This team is “comprise[d ] [of] educational partners who are invited by the department to provide feedback to drafts of a document at various stages in its development” (Provincial Education, 2014, Development Teams section, para. 6). It then includes quite an exhaustive list of possible participants. The suggestions include:

Representatives from: various governmental departments/branches, from educational partners such as business, industry, labour, manufacturing, and communications, from professional organizations (e.g., [Provincial] Association of School Superintendents, [Provincial] Association of School Trustees, [Provincial] Teachers' Society, Éducatrices et Éducateurs Francophones du [Province], Council of School Leaders, Special Area Groups), from postsecondary education and training institutions, [and] from Advisory Councils for School Leadership through the [Provincial] Association of Parent Councils and the Fédération Provinciale des Comités de Parents (Provincial Education, 2014, Development Teams section, para. 6).

It is noteworthy that these are suggested groups for the review panel and that some or all of these people need not be involved. Again, it is implied that the main curriculum team comprised of the teachers, scholars, and team leader hold the veto power for suggestions given from the possible review panel representatives.

The document then describes the field validation team. “ The purpose of field validation is to field test a curriculum document in classrooms so that necessary improvements can be made based on input from classroom teachers” (Provincial Education, 2014, Development Teams section, para. 8). This is an important step in that it “is undertaken in those instances in which the content focus and instructional and assessment approaches in the new curriculum for a subject area differ significantly from the content and approaches in former documents” (Provincial Education, 2014, Curriculum Development Process section, para. 3). That is, if a new curriculum is significantly different than the previous, a field validation takes place in order to improve the new curriculum. The improvements are based upon the feedback from the practical implementation by teachers.

Next the curriculum process document describes the step of “Authorized Principal Use” (Provincial Education, 2014, Development Teams section, para. 11). “[This step] occurs once a curriculum has been field tested and revised as necessary; it is then mandated and released for authorized provincial use” (Provincial Education, 2014, Development Teams section, para. 11). This describes the official release of the *Curriculum Framework* document for a particular course that imposes its implementation for all teachers in the province.

Finally, the curriculum ‘ends’ with a step that is ongoing: “Continual Updating” (Provincial Education, 2014, Development Teams section, para. 12). This “ensure[s] that curricula are dynamic and continuously improved...[It is] designed to reflect the changing demands of society and to ensure that the knowledge and skills students acquire remain relevant” (Provincial Education, 2014, Development Teams section, para. 12). In other words, the development process does not really have an end point because the project leader is required to constantly update the document, keeping it relevant to the present time.

The above described the standard curriculum process that the province uses for all its curricula. This thesis investigates a specific case of this process, ending with completion of the *Provincial Grade 12 Chemistry Curriculum Framework (2013)* written/formal curriculum document. In the following chapter, the document analysis and interview responses reveal the story behind this specific context which was directed by the process given above.

#### **4.3 Basic Organization of the *Provincial Grade 12 Chemistry Curriculum Framework (2013)***

##### **Written/Formal Curriculum Document**

This section describes the outline of the document and briefly explains what the document includes. At the beginning, there is the title page, table of contents, and the acknowledgments section. The acknowledgments section lists the stakeholders involved in the development of the curriculum. It divides the stakeholders into sub-categories: “Principal Writers, Members of the Development Team, Post-Secondary Advisor, [and] Provincial Education” (Provincial Education, 2013, p. vii-viii). After this preliminary section, the document is divided into two main parts. The first half describes the overall philosophy of the document, and the second half lists the specific learning outcomes and focusses on the details of the content.

The first half is divided into the following sections: “Introduction, Section 1: [Provincial] Foundations for Scientific Literacy, Section 2: Implementation of Grade 12 Chemistry, Section 3 Assessment in Grade 12 Chemistry, [and] Section 4: Document Organization” (Provincial Education, 2013, p. iii). The Introduction outlines the overall philosophy of science learning and scientific literacy. Section 2 focuses on the pedagogy specific to chemistry. Section 3 looks at assessment in general, and Section 4 explains how the second half of the document (with the specific leaning outcomes) is organized.

The second half of the entire document follows a consistent format. Each lesson lists the “Specific Learning Outcome, General Learning Outcome Connections, Skills and Attitudes Outcomes, Suggestions for Instruction, Suggestions for Assessment, [and] Learning Resource Links” (Provincial Education, 2013, Section 4 p. 6-7). The “Specific Learning Outcome (SLO) statements define what students are expected to achieve” (Provincial Education, 2013, Section 4 p. 6-7). The “General Learning Outcome Connections sync learning to the [Provincial] Foundations for Scientific Literacy [and the] Skills and Attitudes Outcomes define expectations across all topics in Grade 12 Chemistry” (Provincial Education, 2013, Section 4 p. 6-7). The “Suggestions for Instruction relate directly to the attainment of the specific learning outcome(s)” (Provincial Education, 2013, Section 4 p. 6-7) and includes the subsections “Entry-Level Knowledge, Assessing Prior Knowledge, [and] Teacher Notes” (Provincial Education, 2013, Section 4 p. 6-7). This section basically gives ideas for what specifically to include in a typical lesson. The “Suggestions for Assessment” (Provincial Education, 2013, Section 4 p. 6) section provides ideas for how to assess the specific learning outcome. These sections usually include suggestions for what is called “Paper-and-Pencil Task [and] Journal Writing” (Provincial Education, 2013, Section 4 p. 7). That is, what is it that students should actually do to demonstrate their learning. Lastly, the “Learning Resource Links” (Provincial Education, 2013, Section 4 p. 7) section indicates where to find materials that directly address the specific learning outcome.

#### 4.4 Document Analysis

##### **4.4.1 Main similarities and differences between the *Provincial Grade 12 Chemistry Transitional Curriculum Framework (1998)* and the *Provincial Grade 12 Chemistry Curriculum Framework (2013)*.**

By analyzing the 1998 transitional document and the 2013 curriculum, it appears that the 1998 document had a large influence on the development of the 2013 curriculum (as outlined more specifically in a following section). For this reason, it is important to understand the underpinnings of the transitional document in order to fully understand the influences on the new 2013 document. This next section outlines the main themes of the transitional document, and then draws the connection to the 2013 document. The underpinnings of the transitional document are only described in general terms because the goal is to better understand the newer 2013 document. The 2013 document is analyzed in more detail later on in the section.

The 1998 transitional document was a pre-cursor alluding to a new soon to be released document that was to be influenced by the *Pan-Canadian Framework of Science Learning Outcomes K-12* (Council of Ministers of Education, 1993). The *Pan-Canadian Framework* outlined “A plan for future directions in Canadian education” (Council of Ministers of Education, 1993, p. 1). Before the 1998 document, the 1984 Chemistry curriculum was textbook driven and provided no explanation of the theoretical foundations in chemistry education. The question remains as to whether or not there was any foundation other than a content-driven curriculum? This foundation was heavily academic rationalist (Eisner, 1979, p. 61-86). The 1998 document provides a small section of twenty-five pages of curricular philosophy and foundations, a noteworthy addition for chemistry education. One claim the 1998 document makes at the outset is that, “Although there is no universal agreement on the goals of science

education, a consensus seems to be emerging among science educators” (Provincial Education, 1998, p. 7). It is interesting that a document was even developed in the first place when the overall goals were never fully agreed upon. The 1998 document is organized by units, followed by topics within that unit, and what the prescribed learning outcomes are within that topic. It contains a large number of prescribed learning outcomes, which was vastly reduced in the 2013 curriculum.

The 2013 document is based on the new protocol of the *Pan-Canadian Framework of Science Learning Outcomes K-12*. The 2013 document identifies that which was not identified in the earlier document, namely the goals for Canadian science education. Along with this, the 2013 document identifies many general learning outcomes that are mainly influenced from the *Pan-Canadian Framework*. This document vastly decreased the number of specific learning outcomes compared to the 1998 document. Along with a decrease in the number of identified outcomes, there is a significant increase in the amount of information on curriculum foundations and learning theory. The learning theory in the 2013 document goes from identifying how Grade 12 students learn in general to how students are known to best learn chemistry concepts, mainly through the different modes of representation. The 2013 document also provides an explicit list of “Changing Emphases in Science Education Content Delivery” (Provincial Education, p. 3), which identifies key ideas of what the emphasis of chemistry education should be. An example is “less emphasis on knowing facts and scientific information...[to] more emphases on understanding scientific concepts and developing abilities of inquiry” (Provincial Education, 2013, p. 3). The 2013 document added a unit on “Reactions in Aqueous Reactions” (Provincial Education, 1998, Section 4 p. 25) and deleted the “The Nature of Chemistry” (Provincial Education, 1998, p. 25) unit. Overall, the 2013 document specifically makes clear the

foundations of chemistry education compared to the big picture ideas about science in the 1998 document.

#### **4.4.2 Theories/foundations of the 1998 curriculum.**

The introductory pages of the 1998 curriculum focus on scientific literacy, learning theory, and curriculum design and development. It claims that the “level of scientific literacy among adult Canadians is low” (Provincial Education, 1998, p. 7). It is interesting to then read how the curriculum defines scientific literacy: “Science for meeting personal needs, resolving current societal issues, assisting for career choices, and preparing for further study” (Provincial Education, 1998, p. 7). These tend to touch on a few of Eisner’s (1979) curriculum orientations: personal relevance, social reconstruction, and academic rationalism (p. 61-86). Although these orientations come across as being of equal importance in the introduction, they are not weighted equally in the specific learning outcomes later in the document. The majority of the learning outcomes focus on academic rationalism, while there are only a few outcomes per unit which touch on personal relevance and none on social reconstruction (Eisner, 1979).

In order to develop scientific literacy for the preparation of science-based careers, the 1998 curriculum emphasizes a learning theory of knowledge, processes, and skills (Provincial Education, p. 9). This is the basis for a psychological foundation explained in the introduction section of the document. In general, the learning theory described here is a “constructivist approach...blended with Piaget’s cognitive development theory, especially concerning the difficulty of transitional from concrete operational to formal levels of reasoning” (Provincial Education, 1998, p. 8-9). It explains that while Senior Years’ students are concrete operational thinkers, they still need to construct their own contextual meaning to bridge the gap to the formal operational stage (Provincial Education, 1998).

The knowledge section of the document focuses on learning theory with emphasis on knowledge as a social and collaborative process by which scientists seek to expand their understanding of how the world works (Provincial Education, 1998). One would expect this section to be written with an academic rationalist emphasis, but its voice speaks of social adaptation (Eisner, 1979).

The Processes section focuses on using the work of Gagne who was influenced by Pearson about how one learns about science (Provincial Education, 1998, p. 10). Both Gagne's view on induction and Pearson's work on the scientific method guide the inquiry process. The curriculum explains the danger in teaching science or designing a curriculum in this way. It can "grossly misrepresent science and present an erroneous and simplistic view of the discipline" (Provincial Education, 1998, p. 10). It then makes clear that, "Process is dependent on the conceptual knowledge used to investigate a particular phenomenon or problem" (Provincial Education, 1998, p. 10).

The Skills section focuses on how to do science, either through practical experiments or problem solving. The curriculum explains that doing practical experiments does not mean performing "clear-cut cook-book style experiments," (Provincial Education, 1998, p. 10) but that students should "plan and design experiments" (Provincial Education, 1998, p. 10). It goes on to say that experiments should not just verify concepts or laws through experimentation, but students should design experiments with a spirit of inquiry. This supports the constructivist foundation the curriculum claims to be rooted in and also hints at an Eisner's (1979) cognitive processes orientation to curriculum. The curriculum views problem solving in a new way compared to the old 1984 curriculum view of written textbook problem solving. This new way of problem solving is rooted in Dewey's idea that the "method of science [is] problem solving

through reflective thinking” (Provincial Education, 1998, p. 11). This should be done when “students investigate real science phenomena with direct, hands-on activities” (Provincial Education, 1998, p. 11).

When looking at the rest of the document, knowledge is emphasized but the processes and skills foci are diminished. While the document ascribes processes and skills to be just as important as knowledge, the prescribed learning outcomes primarily focus on the knowledge. The processes and skills are limited to a four-hour unit at the start of the course and the remaining eighty-six hours are mostly knowledge-based. An analysis of the prescribed learning outcomes by Peters (2012) reveals that seventy-one percent are content knowledge based outcomes.

The design and development of the 1998 curriculum apparently follows a Tyler model which defines learning objectives throughout (Ornstein & Hunkins, 2008, p. 214). The transitional document’s primary goal of developing scientific literacy in all of the province’s students is characterized in terms of knowledge/science-technology-society-environment (STSE), skills, and attitudes. It attempts to define more general learning outcomes by giving them a specific learning outcome. This is done by putting them in their own cluster called “The Nature of Chemistry” (Provincial Education, 1998, p. 25). Most of the skills and attitudes stem from this cluster.

The 1998 curriculum introductory pages emphasize personal relevance, the development of cognitive processes, social adaptation, and academic rationalism orientations to curriculum. When compared with the specific learning outcomes, there is a major emphasis on academic rationalism and curriculum as technology. The outcomes that attempt to move away from this make less emphasis on the other orientations. It appears that a foundation for chemistry

education in the province was setting the stage for what was to come, but the specific learning outcomes failed to reflect these orientations accurately (Eisner, 1979).

#### **4.4.3 Theories/foundations of the 2013 curriculum.**

The 2013 *Grade 12 Chemistry: A Foundation for Implementation* document is considered to be quite progressive and unique in its approach to chemistry education when compared to other chemistry curricula worldwide (Lewthwaite & Wiebe, 2014). It takes many of the underpinnings outlined in the 1998 transitional curriculum and expands on them greatly. The 2013 curriculum was influenced by and reflects the historical foundation laid by the 1998 document. The 2013 document also takes many of the ideas presented in 1998 and incorporates recent pedagogical practices specific to chemistry teaching and learning. It is mostly based on psychological foundations (Ornstein & Hunkins, 2009) pertaining to learning theory specific to chemistry. Along with the comprehensive expansion of the ideas presented in the 1998 curriculum, other major additions to the foundations are made evident. Throughout the different sections in the first half of the document, the orientations of personal relevance and social reconstruction make themselves evident again and again (Eisner, 1979). This reflects a mixture of two types of curriculum designs within the first half of the document: learner-centered design and society-centered design. The learner-centered design designs curriculum around “students’ lives, needs, and interests” (Ornstein & Hunkins, 2009, p. 197). Society-centered designs bases curriculum around the “needs of society and culture” (Ornstein & Hunkins, 2009, p. 57). Evidence of these two designs is shown in the analysis of the first half of the document. Along with these two curriculum designs, the first half of the document implores a nontechnical-nonscientific approach to development. That is, the development approach does not emphasize

the learners' output, but rather the learners themselves. It emphasizes learning that is not meant to be measured, but experienced in a humanistic way (Ornstein & Hunkins, 2009).

The vision for scientific literacy continues to be a major emphasis in the 2013 curriculum. The section that defines scientific literacy promotes mostly social and personally relevant agendas. This is in contrast to the 1998 document which offers a more balanced approach (in terms of Eisner's (1979) orientations to curriculum) to what scientific literacy should be. The 2013 document emphasizes "global interdependence... [and a] sustainable environment, economy, society" (Provincial Education, Introduction p. 1). In the 1998 document, the idea of scientific literacy is presented "assisting for career choice, and preparing for further study" (Provincial Education, Introduction p. 7). In the 2013 document, it is presented in more general social terms as "[assisting] in building stronger futures for Canada's young people" (Provincial Education, Introduction p. 1). This new wording does not solely promote entering a science related career, but suggests that scientific literacy permeates a broader horizon for that which builds "stronger futures for Canada's young people" (Provincial Education, Introduction p. 1).

The 2013 curriculum responds with much greater clarity to the question that was left unanswered in the 1998 document, namely, what are the goals for science education? These goals are taken verbatim from the *Pan-Canadian Science Framework*. The curriculum outlines five goals for science education that fit well with Eisner's (1979) orientations to curriculum. The first goal encourages students to "develop a rational sense of wonder and curiosity," (Provincial Education, 2013, Introduction p. 2) which has a personally relevant tone as purported by Eisner (1979). The second goal focuses on using "science and technology to acquire new knowledge and to solve problems" (Provincial Education, 2013, Introduction p. 2) which promotes Eisner's

(1979) development of cognitive processes. The third goal is to “prepare students to address science-related societal, economic, ethical, and environmental issues critically” (Provincial Education, 2013, Introduction p. 2). This has overtones of Eisner’s (1979) social reconstruction orientation. Finally, the last two goals identify preparing students for higher-level study and careers in science, which is an academic rationalist orientation to curriculum (Eisner, 1979).

The curriculum is designed as outcome-based with quite mechanistic specific learning outcomes for most of the units as outlined in the second half of the document. This reflects a different curriculum design in the second half of the document compared to the first half. The second half of the document implores a subject-centered design, where “subject matter [is the] organizing foci” (Sowell, 2005, p. 55). Along with the subject-centered design, it also shows evidence of a technical-scientific approach to development. This means-ends approach emphasizes “students learning specific subject matter with specific outputs” (Ornstein & Hunkins, 2009, p. 212). The content is organized into logical flows in order to foster learning. Each of these units uses these mechanistic outcomes and seldom includes outcomes that deviate from this. In the “Electrochemistry” unit, for example, the majority of the outcomes are content driven with one making reference to personal relevance (Eisner, 1979). An example of a content driven outcome is where students can “calculate standard cell potentials, given standard electrode potentials” (Provincial Education, 2013, Section 4 p. 17). The one personally relevant (Eisner, 1979) outcome that makes reference to an application to daily life states, “Describe practical uses of electrolytic cells” (Provincial Education, 2013, Section 4 p. 17). It suggests that the inclusion of this one outcome was a way to satisfy the personal relevance (Eisner, 1979) orientation emphasized in the first half of the document. The question becomes whether that is

enough to create a balance among the orientations emphasized in the first half of the document, mainly, personal relevance and social reconstruction (Eisner, 1979).

The design of the 2013 document shows evidence of a humanistic orientation (Ornstein & Hunkins, 2009, p. 200). This is evident in the very first pages of the document where it states, “Scientifically literate individuals can more effectively...make informed decisions, accommodate change, and achieve new understandings” (Provincial Education, 2013, Introduction p. 1). Making an informed decision draws upon a person’s value set and moral standards. In turn, a scientifically literate person can also accommodate change and achieve new understandings based on their ideal “how to live” philosophy.

The 2013 document defines five foundations on which scientific literacy is built: nature of science and technology, STSE, scientific and technological skills and attitudes, essential science knowledge, and unifying concepts. These foundations were adapted from the *Pan-Canadian Framework* and further explanation is given to each. Furthermore, within each foundation, general learning outcomes are identified for how students can achieve an understanding of these general foundations. Again it is interesting to note the social and personal slant each foundation emphasizes in its explanation. In the STSE section, for example, sustainability education is promoted in great detail. This is a new idea that does not present itself at all in the 1998 curriculum. It explains the importance of sustainability from not only an environmental standpoint, but also from an economic, human health, and socially responsible standpoint. It explains that sustainable development should be used as a decision-making model in students’ evaluations and actions. This speaks to an element of moral education being included in the province’s science education curricula. Another example is in the unifying

concepts section which brings forth ideas of diversity and elements that promote constancy and change over time.

As with the 1998 curriculum, the 2013 is rooted in constructivism. Dewey's contribution to constructivism is voiced in the curriculum. The curriculum states that, "Students are curious, active learners who have individual interests, abilities, and needs" (Provincial Education, 2013, Introduction p. 2). Piaget's voice is also heard. The curriculum goes on to say that students learn most effectively when "their study of science is rooted in concrete learning experiences related to a particular context or situation, and applied to their world of experiences, where appropriate" (Provincial Education, 2013, Introduction p. 3). The Chemistry document also makes reference to Bruner's model of the spiral curriculum by saying that "learning involves the process of linking newly constructed understandings with prior knowledge, and then adding new contexts and experiences to current understandings" (Provincial Education, 2013, Introduction p. 3).

Another foundation in the 2013 curriculum is inquiry-based education with an emphasis on investigation. The document contains a section that identifies the "changing emphases to promote inquiry" (Provincial Education, 2013, Introduction p. 3). It includes a list of pre-conceived notions underlying earlier approaches to teaching chemistry. The document moves on to identify new approaches in chemistry education with major emphasis on that which is factual and academic. An example is to give "less emphasis on...getting an answer... [and] more emphasis on...using evidence and strategies for developing or revising an explanation" (Provincial Education, 2013, Introduction p. 4).

The curriculum also gives an outline of processes that engage students in scientific learning. The idea is that if students are given a starting point in their learning, it can lead to exploring, investigating and/or applying new ideas (Provincial Education, 2013, Introduction p.

5). Each of these processes is again influenced by constructivism. This section of the document appears to present Bruner's idea of scaffolding and Vygotsky's idea of zone of proximal development. Teachers need to start with where the students are and then bring them to the next level. In order to achieve this, certain supports need to be put in place to enable students to attain this new level. The curriculum explains processes that can help achieve this engagement: science inquiry, problem solving, the nature of science, science-related skills, and science content knowledge. In the explanations of each of these processes, personal relevance (Eisner, 1979) and social issues are repeatedly emphasized. One example in the decision making section is that students should "pursue new knowledge that will assist them in making informed, rational, defensible decisions that are rooted in the societal and humanistic domains within which science practice operates" (Provincial Education, 2013, Introduction p. 5). Another example is in the "Nature of Science" section where it explains that, "Science operates with the consent of personal, social, political, environmental, and multicultural orientations of the global society." The most notable example is the emphasis of personal relevance and social adaptation/reconstruction (Eisner, 1979) in the science content knowledge section itself. The explanation makes very clear that the "transmission of science content is no longer considered to be the primary outcome of science teaching. Instead, science knowledge is to be actively constructed from existing and emerging personal and social knowledge" (Provincial Education, 2013, Introduction p. 5). This is unexpected as science content knowledge is usually viewed as being passed on to the student in a rote or factual way.

The foundations for the 2013 curriculum discussed above outline the foundations on which all science curricula in the province are built. These foundations set the stage for what the Chemistry curriculum should reflect. The next section of the document is the single most

influential expansion from the 1998 curriculum. It is specific to chemistry teaching and learning and explains a “view of chemistry education: toward modes of representation” (Provincial Education, 2013, Section 2 p. 18). In an introduction letter that accompanies the curriculum document, this new addition to these psychological foundations (Ornstein & Hunkins, 2009) of learning theory specific to chemistry is highlighted. It states that there is a need to develop a more conceptual approach in chemistry education, focusing on particulate representations rather than the algorithmic calculations and that there are strengths to using the modes of representation approach (i.e., macroscopic/visual, numerical, graphical, symbolic, and particulate). The curriculum explains that often in chemistry, ideas and relationships are expressed in a symbolic or mathematical way which is the most abstract realm. In order to achieve a deep understanding of concepts, and hence connect its relevance and application, students must be able to represent the concepts in a variety of forms. The form that the curriculum emphasizes is the particulate mode, which teachers may not be familiar with. That is, what the particles in a chemical system are doing and how they are behaving and interacting. This mode is a way to connect the macroscopic (visual) mode to the symbolic (Johnstone, 1993, p. 701-705). In the 1998 curriculum, the relationship between the macroscopic and symbolic modes of representation is made very clear. The problem was that the jump from real world chemistry (macroscopic) to abstract equations (symbolic) neglected a psychological understanding of why chemical systems behave the way they do. Although not explicitly stated, this part of the curriculum is based on the Johnstone (1993) model of chemistry education. The document further explains that the modes of representation are important, but meaningful connections can be difficult to make unless they are explored in context. This idea alludes to a model that came after this curriculum was developed and is credited to Mahaffy (2006). Mahaffy’s (2006) model added another mode of

representation called the “human element” (p. 50). The “human element” (Mahaffy, 2006, p. 50) expresses chemical concepts in terms of an historical or applicable context. It is the idea that chemistry concepts need to be explored and understood throughout some sort of human interaction. These modes of representation define a psychological foundation (Ornstein & Hunkins, 2009) in chemistry that promotes the development of cognitive processes (Eisner, 1979).

The last foundation specific to chemistry presented in the curriculum document is identified as an “instructional philosophy in chemistry” (Provincial Education, Section 2 p. 25). This is the first time an instructional philosophy is laid out to Chemistry curricula in the province’s history. It explains that historical perspectives and an understanding of how the nature of science will help students understand a more philosophical base in chemistry. A foundation of development of cognitive processes (Eisner, 1979), social perspectives, and humanism (Ornstein & Hunkins, 1979) can again come into play with the attempt to develop this instructional philosophy. The curriculum explains that, “Teaching Grade 12 Chemistry [should] focus on content and processes...that is influenced by cultural priorities and humanistic perspectives...the inclusion of social, historical, and political implications in the study of chemistry provides students with opportunities...to communicate ideas effectively” (Provincial Education, Section 2 p. 25-26).

The foundations of the 2013 document are rooted in foundations common to all science courses in the province, but also include psychological and philosophical foundations (Ornstein & Hunkins, 2009) that are specific to chemistry. The document goes on to define foundations common to all subjects including general instructional and assessment approaches.

The underpinnings of the 2013 curriculum, while not reflecting a drastic change from the 1998 curriculum, elaborates on many of the ideas in the 1998 curriculum. These ideas include foundations built on constructivism. The 1998 document was created as a transition to the new curriculum, and the 2013 curriculum expanded ideas presented in the 1998 document, especially in terms of learning theory specific to chemistry.

New research and additional information have altered some of the underpinnings that inform the 2013 curriculum compared to the 1998 document. A growing awareness of “how people learn...ways in which student populations are changing...developmental characteristics of students, and the unique qualities of each student” (Provincial Education, 2013, Section 2 p. 3) have influenced some of the changes. The realization that a “period in which technology and knowledge based industries are the primary drivers of the national economy...other areas of science [undergoing] rapid progress...[and] the increase in availability, power, and sophistication of [computers]” (Provincial Education, 2013, Section 2 p. 16) have also impacted the underpinnings.

#### **4.4.4 Similarities and differences between learning outcomes in each document.**

In the 1998 document, one would expect the specific learning outcomes to reflect the ideas presented in the introduction section. The 1998 curriculum identifies a social problem, namely, the lack of scientific literacy in the adult population. The response to this solution (in the specific learning outcomes) is for socially reconstruction by implementing an academic rationalist approach (in the specific outcomes). The solution to the problem of lack of scientific literacy is to still learn a lot of chemistry. This academic rationalist approach is evident in the extensive and numerous outcomes (Eisner, 1979).

It is noteworthy that while the theoretical underpinnings are made clear in the 2013 document, the wording of the outcomes does not reflect these. For the units in each document, the outcomes have not significantly changed. In the 1998 document, the vast majority are often content-driven academic rationalist. Again, the number of outcomes in the 2013 document decreased significantly, but the academic rationalist wording is evident throughout (Eisner, 1979).

Noteworthy units in the 2013 curriculum that did not appear at all in the 1998 curriculum are “Reactions in Aqueous Solutions” and “Atomic Structure” (Provincial Education, 2013, Section 4 p. 13-14). Both units contain mostly content-oriented outcomes. The wording of most of the outcomes in the 2013 document appears to be inconsistent with the foundation for chemistry education advocated for in the introduction to the document. One would expect the specific learning outcomes to be congruent with the foundations upon which they are based upon. There is some evidence of this throughout the outcomes section, but the vast majority is still bounded by an academic rationalist orientation (Eisner, 1979). One might expect these two new units to reflect more the foundations described in the first half of the document, but they do not.

#### **4.5 Analysis of Specific Learning Outcomes and its Associated Content in the 2013**

##### **Document**

In this section, the specific learning outcomes are analyzed in terms of Eisner’s (1979) five orientations to curriculum. A colour medley is used to visually see which orientations become evident in the analysis. The more the colour, the more that certain orientation is represented within that unit. This analysis is used to help identify the main orientations evidenced in the curriculum. Not only is the wording of the specific outcomes taken into

analysis, but also the other sections included in the pages tied to that outcome (e.g.: “Suggestions for Instruction” (Provincial Education, 2013, Section 4 p. 6) section). If an orientation was evidenced within the outcome wording or in the other pages, that colour was included in the specific learning outcome code. Furthermore, the next section, which analyzes the interviews with stakeholders, provides triangulation of data of the main influences on the construction of the curriculum. The specific outcome code was taken for each of the outcomes and listed below. Each outcome was classified in terms of Eisner’s orientations to curriculum (as outlined in the Chapter Two: Literature Review of the thesis). Some outcomes and its associated content identify themselves clearly with one specific orientation, but some outcomes and its associated content may straddle among two or more. If the latter is the case, the specific learning outcome code was highlighted with the fraction of colour it represents. The actual words of each outcome were not highlighted in their corresponding orientation colour because the length of wording does not necessarily represent the fractional proportion of orientations the outcome represents. In turn, just the code was used because each outcome then contains the same number of characters. If an outcome meets more than one orientation, then that colour proportion was decided by estimating the amount of references both the specific learning outcome and associated content.

Table 2

*Legend for Colour Medley*

<i>Academic Rationalist</i>
<i>Development of Cognitive Processes</i>
<i>Personal Relevance</i>
<i>Social Construction/Social Reconstruction</i>
<i>Curriculum as Technology</i>

Table 3

*Colour Medley for Specific Learning Outcomes and Associated Content*

Topic	1	2	3	4	5	6
Specific Learning Outcome	C12-1-01	C12-2-01	C12-3-01	C12-4-01	C12-5-01	C12-6-01
	C12-1-02	C12-2-02	C12-3-02	C12-4-02	C12-5-02	C12-6-02
	C12-1-03	C12-2-03	C12-3-03	C12-4-03	C12-5-03	C12-6-03
	C12-1-04	C12-2-04	C12-3-04	C12-4-04	C12-5-04	C12-6-04
	C12-1-05	C12-2-05	C12-3-05	C12-4-05	C12-5-05	C12-6-05
	C12-1-06	C12-2-06	C12-3-06	C12-4-06	C12-5-06	C12-6-06
	C12-1-07	C12-2-07	C12-3-07	C12-4-07	C12-5-07	C12-6-07
	C12-1-08		C12-3-08	C12-4-08	C12-5-08	C12-6-08
	C12-1-09		C12-3-09	C12-4-09	C12-5-09	C12-6-09
	C12-1-10		C12-3-10	C12-4-10	C12-5-10	C12-6-10
	C12-1-11			C12-4-11	C12-5-11	C12-6-11
	C12-1-12			C12-4-12		C12-6-12
				C12-4-13		

Clearly, the **yellow** (academic rationalism (Eisner, 1979)) dominates the second half of the document. The analysis included any other orientation that even remotely presented itself in the curriculum. In this regard, even the above analysis is very generous. For example, **C12-1-19** is coded with mostly **yellow** (academic rationalism) and a small proportion of **blue** (personal relevance) for the following reasons. Firstly, the specific learning outcome has complete reference to academic rationalism (Eisner, 1979). It states, “Determine the oxidation numbers for atoms in compounds and ions (Provincial Education, 2013, Section 1 p. 48). There are then seven pages of associated content that outlines very mechanistic steps to determining an oxidation number, then two lines of text in the “Journal Writing” (Provincial Education, 2013, Section 1 p. 48) section that state, “Ask students to propose how the rotting of food relates to oxidation and combustion. Ask them to explain how burning and rusting are similar yet quite different” (Provincial Education, 2013, Section 1 p. 48).

It is intriguing that even with this analysis procedure examining the specific learning outcome and its associated content, the vast majority of this part of the curriculum is dominated by academic rationalism. Furthermore, many (seven out of twenty-four outcomes) of the codes that are coloured **yellow-green** are actual specific learning outcomes that start with “perform a laboratory activity” (Provincial Education, 2013, Section 4 p. 13-17). The other **yellow-green** coded outcomes are content-oriented, but have a particulate level aspect emphasized somewhere in the specific learning outcome, or in the associated content. Again, compared to the number of **yellow** coded outcomes, the **yellow-green** is very small. The entire list of outcomes also shows a curriculum as technology orientation. Although not shown in the table, all outcomes have **red** associated with them as well.

#### **4.6 The Disconnect Between the Introduction (First Half) and Specific Learning Outcomes and Associated Content (Second Half) Sections of the Document**

The analysis of the 2013 curriculum indicates there are two different orientations underpinning the curriculum, one for the first (introductory) half and the other for the second half of the document (learning outcomes). As discussed above, the first half of the document presents a fusion of learner-centered/society-centered design where the curriculum is based around the needs of the learner and the needs of society (Ornstein & Hunkins, 2009). Conversely, the second half of the document implores mostly a subject-centered design where content, largely void of context, is the focus for learning. The question then becomes, why would the first half and second half of the document reflect totally different curriculum orientations?

Along with the differences in curriculum design between the first and second half of the document, there is also a difference in the approach to developmental learning. The first half of the document reflects a nontechnical-nonscientific approach where learning is holistic, which cannot be broken down into a series of steps. On the other hand, the second half of the document reflects quite an ordered, logical flow of learning activities, which is demonstrative of a technical-scientific approach (Ornstein & Hunkins, 2009). Again, what is the reasoning for each half of the document showing two different types of development approaches?

The 2013 document's specific learning outcomes and associated content are still bound mostly by academic rationalism (Eisner, 1979). Although the introductory pages of the document laid a foundation of personal relevance and social reconstruction (Eisner, 1979), there is a major disconnect between the introduction pages and the specific learning outcomes and associated content. Because teachers tend to look at only the specific learning outcomes in a curriculum, the wording of these need to reflect the intentions of the document laid out in the beginning. If

specific learning outcomes are viewed as isolated bits and pieces are taken out of context, misinterpretations and misunderstanding arise. Because teachers often look just at the specific learning outcomes and not the context or foundations upon which they are based, they are unlikely to modify the way they teach chemistry.

The 1998 and 2013 curriculum documents are each a reflection of a group of individuals' autobiographies, whose ideologies reflect their understanding of what chemistry education should be in the province. These ideologies change with the people that are brought together, the time and context in which they exist, and the understanding of educational research at that time. It seems, as evidenced in the introductory sections of the curriculum, that there is a strong voice in this section calling for major change in the foundational principles in chemistry education. Despite this, the learning outcomes are still bound in a traditionally laden, academic rationalist orientation (Eisner, 1979). This prompts a further question pertaining to this study that needs to be explored: why is there disconnect between the first and second halves of the curriculum document in terms of design, development, and orientations to curriculum? Why are they so different? Why can the curriculum text be so different in stated and implied intention?

#### **4.7 Chapter Summary**

Chapter Four dealt with the written document sources needed for this study. First, it outlined the process the province uses to develop all curricula. A general overview of this process, along with details of the selection and structuring of the developments teams were presented. Because the 2013 document was built upon the 1998 transitional document, they were both analyzed in terms of the theories and foundations that underpin each. The foundations/orientations of the 2013 document were important to identify in order to help determine the factors that influenced it, which is what this thesis seeks to find out. The 1998

transitional and 2013 curriculum documents were not only analyzed individually, but also compared and contrasted with each other. An analysis of the 2013 curriculum showed a theoretical difference between the underpinnings identified in the first half (introduction) section of the document and the second half (specific learning outcomes and associated content). The last section of Chapter 4 describes this query. The information presented and analyzed in the next chapter will focus on participants' experiences with the construction process and help to answer this query that has emerged in the document analysis.

## Chapter Five: Data Results and Analysis

### 5.1 Introduction

This chapter reports and analyzes the data from the participant interviews. It seeks to represent the data in a narrative approach, bringing light to the perspectives of individual participants. The data is organized into emergent themes via cross-case analysis (each case being an individual participant). Data is organized below into emergent categories. There are four overarching categories that the data is divided into: Section 5.2 is the influences on the 2013 curriculum, Section 5.4 is the experiences of stakeholders, Section 5.5 is the stakeholders' views of the curriculum construction process and product, and Section 5.6 reports stakeholders that experienced a transformation. Within each of these over-arching themes, there are sub-themes that emerged within these sections. These sub-themes are described at the beginning of each section.

### 5.2 Influences on the 2013 Curriculum

In this section, the data from the interviews and document analysis is presented and analyzed in terms of themes that arose among participant responses. The overarching theme presented in this section is the identified influences on the 2013 document. The participants were asked a series of questions that required each to describe their chemistry classroom, so the influence of each participant as a possible autobiography could be determined. They were also asked directly what they saw as the major factors that influenced the document. The themes that emerged under the participant perspectives of influences on the curriculum document were: the *Pan-Canadian Protocol*, the *Provincial Grade 12 Chemistry Transitional Curriculum Framework* (1998), the content-emphasis in the curriculum, preparing students for university, the need for more lab activities, making the document user-friendly, the microscopic/particulate

level of understanding, political influences, a lack of resources, the curriculum development model, a variety of development team member perspectives, and an absence of clear overall vision. Each of these themes will now be explored in this analysis section.

### **5.2.1 The *Pan-Canadian Protocol*.**

A first factor that emerged from the interview data was the influence of the *Pan-Canadian Protocol*. Three out of the eight participants directly identified the *Pan-Canadian Protocol* as an influence. One participant pointed out that there was a desire for Canada as a whole to have a similar philosophy in terms of science education. S/he (pronoun used to preserve anonymity) stated that, “The Pan-Canadian was obviously a huge influence because at the time, the philosophy or the direction that education was going in was that all of Canada would have fairly similar curriculum” (Participant, personal communication, March, 2014). Another participant picked up on this as well, except pointed out that certain provinces wanted to make it so students could more easily transfer from one province to another. S/he explained that, “The main [(influence)] was the Western Canada Protocol [*Pan-Canadian Protocol*]-a common framework that would allow them to move from one province to another” (Participant, personal communication, March, 2014). Another participant then explained what that meant in terms of the province’s context. S/he explained that this protocol would serve as a guide for all science curricula in the province. S/he stated that:

In the case of [the province], the decision was made that all K-12 Science curricula at all levels was going to undergo a renovation, maybe some degree of reconstruction, but the basis for that development was principally going to be the Pan-Canadian framework, not exclusively, but certainly as a set of guiding principles (Participant, personal communication, March, 2014).

Further to this, a participant explained that, “There was the opportunity for the teacher development team to see that framework as having negotiable room with in it for creating

change” (Participant, personal communication, March, 2014). This participant pointed out that there was some flexibility in terms of how stringently the team needed to follow the document. It was more of a guide that left room for some flexibility. S/he further explained that, “It was going to be a template, a framework, a guiding document, perhaps a set of recommendations but it was very clear that the provincial autonomy that had always been enjoyed by the provinces with respect to curriculum was going to be respected even in this particular instance where there might have been a desire for greater more comprehensive standards across the country” (Participant, personal communication, March, 2014). That is, the protocol sought to bring together standards for the Canadian provinces (with the exception of Quebec), but also allowed room for development teams within the provinces to develop the curriculum with reference to their own contexts. The theme that arose from the interviews, the influence of the *Pan-Canadian Protocol*, was also evidenced in the document analysis of both the 1998 transitional and 2013 curriculum documents as outlined in Chapter Four.

### ***5.2.2 Provincial Grade 12 Chemistry Transitional Curriculum Framework (1998).***

A second theme that emerged from the interviews was that the *Provincial Grade 12 Chemistry Transitional Curriculum Framework (1998)* was another influence on the 2013 document. Three participants identified this directly as an influence. One participant stated it quite bluntly by saying that, “[The 1998 transitional curriculum was a] huge influence...[it] doesn’t seem like there is a huge difference between the 1998 transitional and this one.” (Participant, personal communication, March, 2014). A second participant explained how the 1998 transitional was a basis for the learning outcomes that would come in the 2013 document. S/he stated that, “[We looked] at the outcomes that we already had available to us from what was called the 1998 transitional curriculum in [the province]” (Participant, personal communication,

March, 2014). A last participant described how the 1998 transitional should be used, by saying that, “The transitional document became a framework for the development” (Participant, personal communication, March, 2014). That is, the transitional became the skeleton of the newer 2013 curriculum.

The majority of participants perceived that the new 2013 document was not much different than the 1998 transitional document. This perception is verified by the document analysis discussed in the previous section. One participant brought up important insights into this. S/he reflected on the fact that the 1998 transitional document was around for six years (because the unedited draft version of the new curriculum came out in 2004), but that did not necessarily mean that teachers were using it in 2004. S/he revealed that there could have been teachers using the last mandated curriculum, the 1990 document, right up until 2004. S/he stated, “It was just a transitional which means, teachers weren’t obligated to use it in 1998... There [could be] a teacher that could technically still be using the 1990 document” (Participant, personal communication, March, 2014). It is also noted, as outlined in Chapter Four, the document analysis showed that the 1998 transitional document indeed had an effect on the outcome of the 2013 document.

### **5.2.3 Content-emphasis in curriculum.**

A third theme that emerged from the interview data was that the curriculum document was required to emphasize content. Three participants made comments that elucidated the content-oriented nature of the curriculum. One participant commented that the “curriculum is heavily content-oriented” (Participant, personal communication, March, 2014). S/he continued to describe his/her own teaching at the time when s/he was involved in the development of the curriculum. S/he said that:

[My teaching] was content driven. There were divisional exams that pretty much identifie[d] me...those exams were largely content, calculations, largely mathematical...It was lecture, practice, so lecture, worksheet practice, labs, demos... So all the STSE outcomes, none of that was ever examined, so it was all the content stuff (Participant, personal communication, March, 2014).

If this participant had been teaching a content-oriented course at that time, it is likely that this was what s/he represented in the curriculum development process. Another participant made a comment about the type of orientation some people had on the committee. S/he said that, “[There were] people on the committee who are quite essentialist in their approach. And so that comes through in the nature of the curriculum” (Participant, personal communication, March, 2014). Another participant was asked questions about the purposes for different activities that s/he implemented in his/her own classroom. When asked as to the purpose of a laboratory activity, the participant commented that one of the functions of a lab is to learn and understand the certain piece of content within the curriculum (Participant, personal communication, March 2014). Another participant commented that it was not just the specific learning outcomes that emphasized a content-oriented approach, but “it was more the supplementary activities, pure essentialism” (Participant, personal communication, March 2014). It is also noted that the emphasis on content as a factor that influenced the curriculum came about in the document analysis as well.

#### **5.2.4 Prepare students for university.**

A fourth theme that emerged from the interview data was that the committee wanted one of the goals of the curriculum to prepare students for university. Five out of the eight participants talked about this as one of the realities for students and teachers who take chemistry in high school. One participant outlined this reality in high school by saying that,

As soon as you get to high school science, [preparing for university] is always going to be part of it and it is a very real pressure in schools that teachers are facing and it is true

that [chemistry] is a specialized course and quite a few students who are taking it will be going on to post-secondary” (Participant, personal communication, March, 2014).

Another participant mirrored this idea by saying that, “If you wanted to pursue anything in universities, you have to get through these Chemistry courses...you also have to prepare them for university” (Participant, personal communication, March, 2014). A third participant generalized this idea to looking toward the future. S/he said that, “It becomes quite clear that a student is going to want to have some natural inclination or some future oriented goal in mind to even take Chemistry 30S and/or 40S in the first place” (Participant, personal communication, March, 2014). There were two participants that reflected on the responsibility that the development team appeared to have in terms of preparing students for what the team thought was ahead for their students. One participant explained this responsibility by saying that:

The group of teachers felt the certain responsibility...to [ensure] as best that they could, that the students were going to have a solid foundation and have a solid preparation for any future advance study that might involve, things such as principles coming out of Chemistry (Participant, personal communication, March, 2014).

Another participant explained that this responsibility is a social construct of a chemistry teacher’s role. S/he explained that the development team valued “university preparation” (Participant, personal communication, March, 2014) and that this is a “socially constructed view that teachers have of their role” (Participant, personal communication, March, 2014). One question that arose was what does preparing students for university mean? Most participant responses explained that the students are introduced to content before they get to university. One participant reflected on this question in the following quote:

There is a place for some content, some preparation, but...does that preparation mean that you are teaching what they will see in their first year university or is preparation [to] teach the students how to think so that they'll be ready for whatever that comes at them...I think some of the views were that you really needed to prepare students for post-secondary...[so that] some of the students that would come back would thank their

teachers because, ‘Oh, you taught me this and I saw this in post-secondary so I was prepared for it’ (Participant, personal communication, March, 2014).

The committee decided that an entire unit be added to the curriculum at the last minute. The team had established a pretty good outline for what content topics were going to be included. The factor of preparing students for university again influenced the document by bringing in the topic Atomic Structure because teachers around the province were already teaching it to give their students a head start for university. One participant explained that:

Teachers in the province had been talking about how their students were going to university and having to deal with atomic structure in university. Teachers felt compelled to teach some atomic structure anyway within their courses (Participant, personal communication, March, 2014).

### **5.2.5 The curriculum needs more labs.**

A fifth theme that arose in the coding process was that the development team wanted the curriculum to provide “more opportunities for more hands-on discoveries for students” (Participant, personal communication, March, 2014). Four participants commented on the need for more lab activities. One participant explained that:

Kids have to be hands on. They should be doing labs. They should be presented with questions that they can answer through research and through mucking about in the lab... The general feeling of the whole committee was to get people doing more labs, get students touching equipment” (Participant, personal communication, March, 2014).

Another participant explained that one way to encourage lab activities in the curriculum was “to make lab activities with outcome[-level] status” (Participant, personal communication, March, 2014).

These four participants commented that the committee had an overall consensus that students should be engaging in hands-on laboratory experiments. In the 1998 transitional document, there were labs as purely supplementary material. In this regard, labs were not officially mandated as

an important of chemistry education in the province. In the document analysis above, the laboratory activities are emphasized by being listed as a specific learning outcome. That is how the committee gave the “lab activities outcome[-level] status” (Participant, personal communication, March, 2014). There was some discussion as to how the committee would tackle this challenge. A participant revealed this discussion in the following quote:

You can't really do Chemistry without doing some lab work, but then a lot of discussions as to how do you make that happen. Do you let the Cluster '0' outcomes dictate that because they're outcomes that you need to do some practical work or do you write outcomes that impose fairly specific types of laboratory activities? (Participant, personal communication, March, 2014).

The decision for the committee was either to include specific types of lab activities with the specific learning outcomes, or to leave it more open-ended in the “Cluster 0: Skills and Attitudes” (Provincial Education, 2013, General Appendices p. 41) outcomes section. They ended up including labs as specific learning outcomes.

#### **5.2.6 Make the document user-friendly.**

A sixth theme identified was that the development team wanted to make the curriculum user-friendly for teachers. The idea was that any teacher in any context could pick and choose whichever resources best fit their situation. Four participants shared ideas to help make the document more user-friendly. First, one participant explained that students should learn less of the overall content in order to make room for a deepened understanding of concepts. S/he stated that:

What I was looking for, is more space to go deeper into certain concepts instead studying tons of things superficially. I thought at the time that it was important to have that time to really focus and give students the time to think about things and think about ideas a little bit more deeply” (Participant, personal communication, March, 2014).

A second participant explained that another way to make the document user-friendly was to provide more teaching resources in the appendices section of the document. A goal was to

provide many resources that reflected specifically what teachers were currently doing in their classrooms. The 2013 curriculum does have many more resources that teachers can use, depending on their teaching context. S/he explained that:

[The curriculum document was] going to be user-oriented at the end of the day, so that the busy chemistry teacher who maybe teaching out of field or teacher who may not have the fortune of likely years of experience in the development of their own materials, they were very enthusiastic about sharing, even sharing the materials that they had developed for their classrooms for inclusion in the document. And that's why, for example the appendices in a document such as this are quite substantial and with many references in the main body of the document to what they were actually doing in their own classrooms (Participant, personal communication, March, 2014).

Two other participants commented that the topics at hand should be stream-lined. That is, they should fit together and be sequenced in a logical way. One of the participants explained that a desire for the curriculum was to improve sequencing within the Grade 12 document itself. S/he stated that, "My hope was to...eliminate overlaps where we could from one unit to the next and streamline the curriculum" (Participant, personal communication, March, 2014). Another participant explained the sequencing in terms of connecting it with Grade 11 Chemistry curriculum. S/he said that, "I wanted it to have some better continuation at the time than the transition document...there was no connection whatsoever with the Grade 11" (Participant, personal communication, March, 2014).

### **5.2.7 The microscopic/particulate level of understanding.**

A seventh theme that emerged from the data was that the curriculum addresses the microscopic/particulate dimension of understanding. This is an idea that also emerged from the document analysis, except the document analysis refers to it in different language. The curriculum document calls it the "Particulate Mode of Representation" (Provincial Education, 2013, Section 2 p. 23). Three out of the eight participants identified the microscopic/particulate dimension as having an influence on the curriculum document. One participant stated very

clearly that, “Trying to figure what was happening at the microscopic level” (Participant, personal communication, March, 2014) was important for the curriculum to portray. Another participant said that, “The influence of the Johnstone model is probably the greatest impact” (Participant, personal communication, March, 2014). A third participant explained very clearly his/her intentions for what the curriculum should reflect. S/he explained that:

I was really wanting it to be informed by learning theory. If we take a look at the Provincial curricula, by tradition, it had put a lot of emphasis on contextual relevance. So the history and philosophy of science had strongly been incorporated...And so I was trying to make sure that there was another orientation to it which was primarily more related to the psychological premise. (Participant, personal communication, March, 2014).

This participant explained that the curriculum should be more balanced with another viewpoint. S/he wanted to influence the curriculum with a way in which students would understand the content. That is, s/he wanted to make explicit that the way in which students should think about chemistry was communicated in the curriculum. S/he went on further to say that:

I wanted to make explicit a psychological orientation...[A] trigonal planar approach [Johnstone model] and I would try to make sure this was explicit within the SLO's so there was reference that that kind of language. That meant if I felt anything was dominated too much by the symbolic, then I would probably try to make sure it was more balanced (Participant, personal communication, March, 2014).

S/he further explained that the way to make sure the curriculum presented these ideas was to reflect them in the specific learning outcomes. Even though the document analysis revealed that the particulate dimension was presented in the introduction to the document, s/he wanted this to have an influence in the specific learning outcomes themselves. That is, the way in which students should think about and understand chemistry should be explicitly stated in the specific learning outcomes.

### 5.2.8 Political influences.

Another theme that arose during the coding of the data was the political influences involved in the process. Four participants commented on factors that influenced curriculum that went beyond what happened around the meeting table. One participant discussed in general terms the increased provincial control over curriculum at the time of the initiation of the development of the new provincial Chemistry curricula. S/he explained that:

There was an interest in having very tight and exclusive control over the contents of curriculum through principally bureaucratic processes. And that, incidentally, is rather symptomatic of what was occurring in many other economically advantaged countries in other parts of the world at that point in time...the neo-liberal globalizing influences which placed new demands of public accountability in schools systems – especially the development of standards and a focus on a model of economic growth. If you look at what was going on simultaneously in science curriculum and places like Germany, Australia, the UK (and we could identify some other countries), you're very much seeing a move away from stakeholder influences and a move towards rather tighter and more exclusive control by state bureaucracies over the construction of curriculum. For the Canadian provinces to have this as a culture within curriculum development would be something that would have been expected given the times (Participant, personal communication, March, 2014).

An insightful observation from this data is that the political influence stretches far beyond the scope of the province. Just because education falls under provincial jurisdiction in Canada, it does not mean it is only tied to provincial political influences. The above quote referenced political influences from other countries having its effect on the province's curricula. The influence of many curricula within developed countries moving toward more state control is an interesting side note.

Another participant indicated the influence the province had on dictating when development of a new curriculum should be initiated. S/he said that, "The province came up with a schedule as to when the curriculum would be revised and so they had already decided that it was eventually to be chemistry's turn to have a revised curriculum" (Participant, personal

communication, March, 2014). Another participant speculated that, “The completion of the Chemistry curriculum was just not seen as a priority” (Participant, personal communication, March, 2014). Another participant commented on the fact that the development team was involved in the process for four years, and the rest of the time it took to release the document was due to government processes. S/he also had an opinion as to why the curriculum took so long to release. S/he explained that:

It’s the politics the reason it took so long...In terms of [the development team’s] input, it wasn’t that long...Within the department there were a lot of change...so two years in the development, one year in the development process another year-ish doing the going around and introducing the teachers to the concepts and then [it went] to the editors. (Participant, personal communication, March, 2014).

### **5.2.9 Lack of resources.**

A ninth theme that arose from the data was the limited resources available to develop the curriculum. One participant mentioned the small number of people who are in charge at the government level for curriculum development for provincial science. S/he brought up that, “There is 1 maybe 2, max 3 people in charge at the government level for Sciences [for] K-12. In French there is 1 person [for] K-12 that means K-8 and then Sciences 9, 10, Biology, Physics, Chemistry. There is one person for this whole science education” (Participant, personal communication, March, 2014). Another participant commented on the small number of text resources available to the province. S/he said that, “The preponderance of the text resources were clearly Ontario curriculum aligned, almost exclusively in the case of Chemistry...what [were we] going to do about it in the case of having certain things within [this province’s] curriculum that weren't going to appear in the resources that were aligned with all the provinces” (Participant, personal communication, March, 2014).

### 5.2.10 The curriculum development model.

Another theme that came out of the interview data was details about the curriculum development model itself. Three participants talked about the model specifically. One participant described the development team as “all chemistry teachers and...a curriculum consultant [from the government] and that was it” (Participant, personal communication, March, 2014). This participant critiqued the model and queried why other outside stakeholders were not involved. Another participant explained that the development team did have a process for involving outside stakeholders. S/he said that:

It works only as well as a process like that can work. And I say that by virtue of the [curriculum development] process not having a mechanism for involving stakeholders around the direct curriculum development table who were not teachers of science. There was no protocol for that. So the wisdom and experience that might come from outside of the teaching profession related to chemistry, this then had to be more of an *ad-hoc* process and that was solely by invitation and that would be at the sole discretion of the department lead on the project as to who those individuals would be from the outside to provide invited expertise. So this of course placed a great deal of professional confidence in the department consultants to make the procedures work effectively and make the appropriate moves in terms of inviting external expertise.” (Participant, personal communication, March, 2014).

This quote revealed an important realization that also occurred in the document analysis in the section titled *4.2.1 Structure of the Development Teams in the Province* of this thesis. It reveals a powerful hierarchy which exerts control over the influence a variety of stakeholders can have on curricula in the province. There is one person that essentially decides what other stakeholder influences can take part in curriculum, that being the department science consultant.

Another participant reflected on the model used in the province. S/he explained it as a:

Distributed leadership-kind of a Balkan state [model]... You appoint a group of people and then they are responsible for developing the curriculum, and that is the typical model used in [the province]. That's why if you pick up the Grade 9 and 10 curriculum, they really read differently. If you read biology, chemistry, physics, and earth science, they're

written by various teams of people. So the chemistry components of Grade 9 and 10 are very essentialist because the people who wrote the 9 and 10 are very likely essentialist in their views of the purpose of chemistry education” (Participant, personal communication, March, 2014).

### **5.2.11 Variety of development team member perspectives.**

One theme drawn from the participant interviews was that there were a broad range of team member perspectives represented at the table. This was evidenced by all eight participants, within a variety of realms. Some perspectives were revealed by stakeholders who described what their classrooms looked like in terms of student learning, and others expressed simply what they viewed as the most important in chemistry education. One participant explained that the nature and process of science was important to him/her in terms of chemistry education. He/She “tried to do as much hands-on as possible...looking at evidence, observations and interpretations of evidence...Develop theories about things that you don’t necessarily see” (Participant, personal communication, March, 2014). S/he extended this emphasis on the nature of science in terms of the particulate dimension, specific to chemistry. S/he explained that, “Chemical reactions that are happening at a particulate level but there's still some evidence and information you can gather to deepen your understanding of what's going on” (Participant, personal communication, March, 2014). In addition to the nature of science, one participant noted other stakeholder perspectives on the curriculum. S/he mentioned that, “People were trying to flavour it, especially with the history and philosophy of science” (Participant, personal communication, March, 2014). Another participant explained that it was important to him/her that students have a grasp of the bigger picture of chemistry. That is, how it relates to the students’ lives. S/he explained this by using an example:

[It is important to take] a lot more time on more essential and important questions...How is this going to affect me later? Why do I need to know this? Why is this so important for me to understand [the] table of the elements?...Because when you’re going to read up on

[it], when your mom is diagnosed with cancer, she's going to want to learn on the internet what's going on and you're going to help her understand. These essential, essential questions...all these SLOs [are] interwoven with life [and] society...You can't always depend on others to tell you what's right for you...[It's that] whole aspect of bigger picture, not just science as a body of knowledge" (Participant, personal communication, March, 2014).

Another participant commented that s/he saw Grade 12 Chemistry as being accessible for all students. S/he stated that, "My concern was to have a general chemistry program that would suit your average student, like not reach your top 5% of your clientele. Chemistry should be wide-based, it shouldn't just be for the elite... Chemistry should be for everybody...be as inclusive as possible" (Participant, personal communication, March, 2014). Another participant emphasized the importance of understanding of concepts, by saying that, "[Chemistry was] not to just memorize things-it was about understanding" (Participant, personal communication, March, 2014). Another participant extended this idea in terms of curriculum development in that the outcomes would not over-emphasize mathematical procedures. S/he stated that:

Providing some assurances, right within, the outcomes...wasn't going to be in the direction of a kind of overabundance of algorithmic manipulation. Being conscious about the degree to which we were mathematizing the Chemistry curriculum beyond what was necessary or appropriate" (Participant, personal communication, March, 2014).

Another participant mentioned the importance of inquiry in chemistry education. This person really wanted students to constantly think beyond what is presented in class. In his/her vision of student learning, "students will self-discover or lead themselves towards the discovery..., at least ask the questions like 'What next? We now have done this experiment, what more could you do with this, or what kind of ideas could this lead you toward and taking it another step?'" (Participant, personal communication, March, 2014). Further to inquiry, a different participant described an example of the team trying to fit in a unit based on inquiry. S/he described it as, "[For] the first unit we had a working title on investigative Chemistry and so we tried to make it

more inquiry based, investigative case study, that sort of thing. But, we just couldn't come up with something that would work" (Participant, personal communication, March, 2014). It seems that the vision for this inquiry approach was there, but the team did not come to a place where they were satisfied with the idea.

One participant confirmed the different perspectives s/he observed when sitting around the table. S/he said:

There will be somewhat of a spectrum of views amongst chemistry teachers - even those who were involved in the curriculum development team - from those who have a very traditional academic rationalist point of view on the teaching of chemistry, that might manifest itself, for example in some rather rigid notions as to what content should be in a high school Science curriculum and what typically should not be in a curriculum at the high school level. To those who think more along the lines of the application of the principles of chemistry or the manner in which chemistry can function in the modern world from the standpoint of its relationships to technology, to the society that we live in, to the natural environment as well as the constructed environment. Certainly in the case of a chemistry curriculum development team, you're going to see teacher orientations that will be quite diverse – but in ways which are quite identifiable and predictable (Participant, personal communication, March, 2014).

### **5.2.12 Absence of clear overall vision.**

A last theme that emerged for the participant interview data was the lack of a clear, overarching vision for the curriculum product or process. Three participants talked about this as an influence on the curriculum document. One participant talked about this in a direct way, whereas two participants revealed this in an indirect way. One participant explained this directly by saying that:

It was very hard to get a gist of what vision we were looking for... What were the objectives we're trying to reach... It seemed really bizarre because in all of this, the teachers that were actually teaching chemistry weren't asked to explain what they were looking for or what the curriculum needed. So after all of those sessions, we still had no clear vision of, 'Okay, what are we trying to do here with this new curriculum. Why are we redoing this curriculum anyway?' All of these fundamental questions weren't answered (Participant, personal communication, March, 2014).

This participant explained that there were no discussions about what the team collectively wanted the curriculum to achieve. S/he explained that there was no clear vision for what the curriculum would achieve. S/he explained that the meetings focussed on what specific content to include for which units but not a discussion about the justification for this inclusion. In an indirect way, two other participants revealed this theme of having a muddled pathway by explaining the way in which the general learning outcomes and specific learning outcomes were dealt with. The general learning outcomes, which identify the pieces of the over-arching vision, were plugged in around the specific learning outcomes, which identify what content to cover. One participant stated that, “[The team] wrote the specific learning outcomes. We wrote the pedagogy and did the alignment of the skills and attitudes [outcomes] and GLO’s [General Learning Outcomes] after” (Participant, personal communication, March, 2014). Another participant described the process the same way. That is, the general learning outcomes being worked around the specific learning outcomes. This participant also explained that the general learning outcomes were already established. The overall vision of science curriculum had already been established by another process and product (i.e., the *Pan-Canadian Framework of Science Learning Outcomes K-12*). This participant’s view was that the Grade 12 Chemistry development team did not take this into consideration until after the content objectives had been identified. This participant explained that:

These skills and attitude outcomes were something that we kind of have to plug into what we were doing...[These were] already pre-established by some other committee...So we are sort of like “Well it has to correlate with your [specific] outcome here” (Participant, personal communication, March, 2014).

Again, this is one participant’s view based on his/her recollected experience.

A fourth participant had a different perspective on this theme. This person explained that the general learning outcomes (GLO’s) were the over-arching expectations across all K-12

science curricula which used the *Pan-Canadian Framework of Science Learning Outcomes K-12* as a basis, which included this province. All the specific learning outcomes (SLO's) and Skills and Attitudes outcomes were subjected to an audit procedure and coded to the GLO's. This was to ensure that there was adequate attention to the twenty-six GLO's in this province's science curricula. The participant commented about the overall vision for this Chemistry curriculum by stating that, "The GLO's were always THE vision and purpose for conducting curriculum construction at all" (Participant, personal communication, March, 2014). These four participants showed that there were multiple interpretations of the same experience—a phenomenological account of the overall vision for the curriculum.

### **5.3 Section Summary**

The interview data and document analysis provides evidence of several emergent themes influencing the 2013 curriculum document. There were a total of twelve factors that influenced the curriculum development process. The section that follows presents the lived experiences of the stakeholders while participating in the curriculum construction process.

### **5.4 Experiences of Stakeholders**

The following section reveals the experiences of the stakeholders during the curriculum construction process. The types of experiences the stakeholders in this study ultimately became the emergent themes identified in the data analysis. The common themes that emerged from each individual experience are presented below. First, there were a number of tensions described by the participants. These tensions included (1) participant reluctance to consider or accept others' points of view, (2) stakeholders feeling undervalued, (3) perceptions that some stakeholders held more control than others, (4) the treatment of outside stakeholders, (5) including pedagogy in the specific learning outcomes, and (6) the late-stage insertion of the Atomic Structure unit. The next six subsections discuss each of these specific tensions that emerged from the interview data.

Section 5.4.7 that follows from this reports on collectively positively viewed experiences, namely, the team's cohesiveness. Last, Section 5.4.8 presents other individual experiences that give insight in understanding the fuller story behind the design and development of the 2013 Chemistry curriculum.

#### **5.4.1 Some reluctance to other points of view.**

A common theme evidenced in stakeholder experiences was the reluctance to considering other points of view. Three participants mentioned this in their remarks. One participant explained how some people were already quite rigid in their notions about chemistry education. S/he stated that, "The stakeholders had already staked their ground...people began to bunker in...people were less open to it being altered to take into consideration some other points of view" (Participant, personal communication, March, 2014). Another participant revealed some disappointment in this by saying that, "It's too bad that not everybody was open" (Participant, personal communication, March, 2014). A third participant made a general observation about the development team as a whole. S/he stated that:

Chemistry educators...were the most reluctant to give up an inordinate focus on content-area knowledge in the curriculum, and seemed to have the most angst about what was going to possibly be eliminated from curriculum to make room for something else" (Participant, personal communication, March, 2014).

Compared to other development teams in the province, this participant also concluded that, "The development team that had the furthest road to travel together as a group in terms of achieving a more broad-based consensus would have been the chemistry group" (Participant, personal communication, March, 2014).

#### **5.4.2 Some stakeholders feeling undervalued.**

Along with some participants not being very open to certain points of view, some stakeholders felt undervalued throughout the process. Overall, most participants did not talk

about experiencing these feelings, but two participants in particular felt that sometimes their ideas were swept aside. One participant painted a picture of tension that s/he sensed when sitting around the meeting table. S/he explained that, “There is always that tension of, ‘Do you know more? You guys know less?’ It wasn’t said. It wasn’t explicitly said, obviously” (Participant, personal communication, March, 2014). This participant explained that there was always this feeling of some knowing more than others and that at certain times, certain peoples’ opinions were valued more than others. This participant recalled more of his/her experience by saying that:

You have to be really confident to voice your concerns or your vision, and I tried, many times...My propositions were not very well received by some...I don’t know how much respect I had or credibility” (Participant, personal communication, March, 2014).

Based on this experience, this participant described how s/he experienced a decision-making process when s/he felt this happening. S/he explained that:

When you voice a concern, opinion or you’re just throwing an idea out there and it’s shut down, a person can decide two things: shut down themselves and say, ‘Whatever, fine. You guys aren’t open to that. I’m just going to not say anything anymore.’ Or fight for it. Fight for what you believe in” (Participant, personal communication, March, 2014).

This participant reflected on a certain incident when s/he experienced this. S/he shared a time when s/he was quite excited about an idea and it ended up being ignored. S/he reflects upon the deflation s/he experienced at that time. S/he told the story:

We were talking about teaching in more authentic ways and I was so excited. I sat up in my chair, I remember and we were writing on the board and all kinds of ideas that how to include different parts of every topic in one theme, sort of [an] interdisciplinary teaching way. I’m like, ‘Okay, we are talking good stuff here.’ That was my opinion on that and I was voicing it, but we were out there, a few minority thinking that way. And it was shut down, never spoken out again, not even considered in a resource for teachers... It was shut down. After that we were just like, ‘Okay, whatever. Fine, we’re just going to go with the flow. Tell us what to do, we’re going to do it.’ That’s pretty much how it went

after that. So the excitement was lost, the motivation wasn't really there. We're just [going to] punch in [and] punch out (Participant, personal communication, March, 2014).

Another participant felt like s/he was being ignored as well. S/he explained how it was to the point where s/he did not want to be officially associated with the curriculum document product.

S/he explained that:

I felt that if what I was saying was being totally shut out, then I didn't want my name on [the curriculum document]. I didn't want my name to be on something, endorsing something that was problematic for me... Your reputation is at stake when your name is on a document... I was really hesitant for my name to be on the Grade 12... I felt that if what I was saying was not being represented, then I didn't want to endorse it at all (Participant, personal communication, March, 2014).

In another way, the teacher development team themselves may have felt a sense of being undervalued. One participant described what s/he experienced at the team meetings. S/he said that there was "a possible sense of inferiority or subservience on the part of the teachers... [in] professional identity and content area knowledge" (Participant, personal communication, March, 2014). S/he explained that if other stakeholders were brought in, teachers can feel inferior in terms of their grasp on the chemical knowledge. S/he explained further that:

It's not typical... That-among secondary level teachers of science-that there is naturally a level of discomfort if they feel that they're not in full command and control of the content area or in the situation at hand that involves points of view" (Participant, personal communication, March, 2014).

S/he went on to explain as to why this might be:

It was a sense of the loss of power, authority and not being able to speak as the master of content area knowledge by individuals who are accustomed to being the final say in a classroom science environment. Not something that would you typically discover as explicit and it's not likely something that a teacher development team member would ever admit to (Participant, personal communication, March, 2014).

This participant explained that the reason teachers may feel discomfort in a situation where there might be other stakeholders that hold more clout in terms of content area knowledge is that a

teacher works in a world where they are in control of a classroom. It is their voice that controls the activities of a class. It is nature of the classroom management that seems to be the drawback for teachers' attitudes towards other authority figures in chemistry content.

Another participant described a specific instance where s/he and few other stakeholders disagreed with the decision to put one or two specific learning outcomes per unit that address a contextual or societal application/issue. S/he explained that:

You guys are all in agreement that we're just going to add an SLO for society, interaction with the society just in a topic somewhere in the beginning or in the end and halfway through? You guys all agree with this?' And then four of us said, 'No, we're not okay with this.' But it was shut down again" (Participant, personal communication, March, 2014).

Again, this participant described how certain ideas were promptly shut down by other stakeholders.

#### **5.4.3 Stakeholder control.**

Another theme drawn from the data revealed some power relationships present during the process. That is, there were instances where some stakeholders held a certain amount of dominance over other people or over the process as a whole. One participant talked about some dominant personalities that existed within the committee. S/he explained that there were:

"Dominant personalities absolutely in there. [There was a] dominant person in that group... So in his/her classroom, s/he's showing us what the experiments that are good and so that's how it works... Whoever imposes themselves, and the leader or whoever's in charge permits that, well that's what's going to happen" (Participant, personal communication, March, 2014).

Another participant described the importance of the leadership role in this regard. S/he explained that:

Here's where a more anonymous process would actually be preferable. Anyone who has ever been involved in a consensus building environment where you have quite strong personalities – in some cases with status that is acknowledged - you know what

inevitably is going to happen. There will be powerful and influential voices that, if not properly managed, can completely carry away the development team in a direction that might only be a minority opinion. Hence the importance of the individual who is chairing the committee to be able to recognize that and to make sure that it's not something that's going to unduly influence the process. You have to expect going in that there are going to be voices around that table that are going to try to wrest the curriculum [away] from some direction other than what they might see as being best for the students of [the province] (Participant, personal communication, March, 2014).

Another participant noted that a stakeholder's role in the curriculum process can automatically hold a position of power. S/he commented that:

The [contract] writer of the document has a lot of control. What we produced as a group, it's all given to the writer of the document. We did all the brainstorming and it's all handed off to the writer of the document. I never saw it after that... I have no idea how it ended and went from there" (Participant, personal communication, March, 2014).

Another participant commented on what happens to a curriculum product once one person completes their job on it. It gets passed on to the next person. S/he stated that once it was passed on, it never came back to them. S/he stated that:

As a committee we never actually went over the whole document... I can see the stuff I submitted there but I'm not responsible for the polish of it. The guts are mine. I can see the guts are mine and the committee's but the final polish is – somebody out there did it" (Participant, personal communication, March, 2014).

A fifth participant commented on the role of the provincial government representative. S/he noted that, "The person from the department would move us along on the process and try to maintain the focus" (Participant, personal communication, March, 2014). This participant indicated the significant influence the government representative had in terms of guiding the group along as whole. This participant also indicated that another experienced/veteran teacher tended to wield some measure of clout. This person did not view this as a bad thing, but rather as a matter of fact. S/he said that:

We did look to one person... We looked to that person because that person had more experience with respect to the process [of curriculum construction] than we did. And so he did have or that person did have more – I would say [s/he] had more influence than perhaps, the rest of us” (Participant, personal communication, March, 2014).

A sixth participant noted that power shifted from one person to another within the group, depending on their area of specialty-namely a specific unit in chemistry perhaps. S/he said that, “It was more like on a topic, one person would have an advantage or not, depending on the topic” (Participant, personal communication, March, 2014).

#### **5.4.4 Treatment of outside stakeholders.**

Two participants revealed some tension involved when the development team of teachers heard from outside stakeholders. One participant mentioned that when an academic in teacher education came to address the committee members, there seemed to be some resistance. S/he said that the academic representative was “likely potentially problematic for some people. It's not uncommon that the people that went through teacher education [might] question the academic's credibility. Then they [may also] question the credibility of people that might involve themselves on committees” (Participant, personal communication, March, 2014). Another participant described the atmosphere of the room when the academic came to make the presentation. S/he explained that:

There were academics there initially, and it led to noticeable silences on the part of the teacher members of the development team...Simply going to be too much tension in the development team to have academic scientists or academics who are teacher-educators in faculties of education working directly month after month after month with the teachers on the development team” (Participant, personal communication, March, 2014).

A participant noticed that the amount of tension between the teachers and academics would not serve work well throughout the curriculum development process. This participant explained that:

There was not a strong interest in a group like this to engage other stakeholders in the process directly...They were reticent, for example, to have individuals who were

chemistry educators at the post-secondary levels and certainly at the faculty of education level sitting right beside them in the development process... You could sense that there was a certain tension there among the teachers for the possible presence of having academics collaborating side by side with them. That was not an unexpected outcome actually, and it is not unique to the sciences to sense that K-12 teachers may not be entirely comfortable being among practicing chemists who had made their mark in industry, or chemists who were academics at a college or university, or chemistry educators who are attached to a faculty of education. It would be desirable to have that multitude of influences collaborating with groups of teachers at the curriculum development level but it may not in all cases be particularly a fruitful one - and it was not necessarily going to be a fruitful one with Chemistry 12... This group of teachers themselves felt much better about being among themselves and having the idea-making from external, 'outsider' stakeholders to be just that - ideas which that can be brought to the table for their consumption, their consideration, their decision making, and their assessment" (Participant, personal communication, March, 2014).

In summary, this participant noted the tension between the teacher group and academic representative was too high to give consideration to a working group which would be anything other than K-12 teachers' contributions.

#### **5.4.5 Pedagogy as an outcome.**

Another theme that emerged from the data was the decision to make the pedagogy of a certain topic explicit within a specific learning outcome itself. Two participants discussed the tension involved when thinking about this decision. One participant noted that there are other examples of this already existing in the province's science curricula. S/he said that, "There are examples already prior to the Chemistry curricula of pedagogy being explicit in the learning outcomes. That's what I was trying to do. I really wanted it to be explicit to teachers about how they should be teaching chemistry" (Participant, personal communication, March, 2014).

Another participant responded to his notion by explained that, "As soon I heard those ideas I thought, 'Okay, that makes so much sense.' I think the next question was how do you integrate it into the course because there's always a tension between is this an outcome in itself or isn't it?"

(Participant, personal communication, March, 2014). This participant then offered an insightful internal cognitive debate. S/he mapped out this debate by saying that:

It is more of a front-end matter sort of thing and there was always that tension... That front-end matter stuff is so important because that's the basis, the philosophy of your course... As a teacher, that's the part you skip at first anyway. You know, you go straight to, 'Okay, what am I teaching? What's the content sort of focus?'... So where does it belong? Sometimes you try to force it through outcomes but it then becomes very directive or prescriptive... sometimes it creates some artificial ways of doing things. So those are some of the conversations that they were interesting (Participant, personal communication, March, 2014).

This participant emphasized the importance of considering a curriculum document as a whole. A consumer of curriculum needs to take the philosophy of the document and the specific learning outcomes into consideration in order to effectively implement the written curriculum.

#### **5.4.6 Presentation of the Content-Area Unit on Atomic Structure.**

A fourth experience, recalled by two participants, drew attention to the Atomic Structure unit in the 2013 Chemistry curriculum document. One participant described his/her experience by saying that:

We had the whole curriculum pretty much put together... And then one of the members made a presentation on the inclusion of Atomic Structure. And so, that person presented to the group a rationale for including the Atomic Structure into the curriculum. And so we decided to work that in and change some things and took some things out for time... We were on our way to the curriculum, while we had something to work with anyway, and then we dropped in Atomic Structure. That kind of took us in a different direction... It was just something that took us back to the drawing board a little bit" (Participant, personal communication, March, 2014).

Another participant described this event as being a minority position which ended up with great influence of the overall product, as treatment of Atomic Structure now appears as an entire unit in the document. S/he explained that:

It's actually that on occasion a position is developed within a curriculum like this where a minority opinion holds weight because it eventually becomes the consensus position of

the group... So if I can point to an example of this effect after having seen this development, I can – I now recognize this as an example of a minority opinion that argued persuasively for the maintenance of certain of aspects of atomic structure to be in the curriculum” (Participant, personal communication, March, 2014).

#### **5.4.7 Team cohesiveness.**

In contrast to the realities of the internal humanity of curriculum development presented above, an alternative theme that emerged was the cohesive nature of the development team. Four participants commented on this. One participant mentioned that nothing that happened throughout the process became a personal issue. S/he said that, “There were the discussions and it was always respectful...It never degenerated into very personal conflicts even though there were some very different points of view” (Participant, personal communication, March, 2014). A second participant talked about this as well by saying that, “We got along quite well so – there wasn’t a whole lot of conflict... it was a congenial group...there were no ill feelings” (Participant, personal communication, March, 2014).

Another participant commented on the varying personalities that existed within the group. S/he said that, “There were great personalities in there also wanting to be open to different kind of ways of doing things. So there was a great group of people in there” (Participant, personal communication, March, 2014). A fourth participant commented on the varying levels of experience present within the group. The existence of these different levels was valued among the stakeholders. S/he stated that, “We always respect individuals who had various experiences that was present to the topics that we are covering” (Participant, personal communication, March, 2014). A fifth participant reflected on how well the development team got along, even to this day. S/he was amazed at the comradery even after the development process was over. S/he stated that, “We got along extremely well even to this day. Every so often we’ll email each other

and we see each other... We were just absolutely amazed at how well we actually got along and how much of a like-mind we had” (Participant, personal communication, March, 2014).

#### **5.4.8 Other experiences.**

This section does not present themes that emerged from the data by cross-case analysis, but rather presents interesting individual experiences. The reason these are presented is to highlight the complexity of the social interactions and multiple perspectives involved in curriculum development. One participant proposed that there was no clear vision for what the curriculum should accomplish. S/he described how ideas were presented to the development team, but the team itself did not strive to establish the vision for themselves. This participant explained that:

It was very hard to get a gist of what vision we were looking for... We had university [representation] trying to tell us what they were looking for and it seemed really bizarre because in all of this, the teachers that were actually teaching chemistry weren't asked to explain what they were looking for or what the curriculum needed. So after all of those sessions, we still had no clear vision... We lost direction of what we were looking for (Participant, personal communication, March, 2014).

This participant experienced feelings of disappointment because s/he felt that because of the lack of direction, some people just kept working to get it finished, no matter the outcome. As discussed in Section 5.2.1 above, the *Pan-Canadian Framework of Science Learning Outcomes K-12* (Council of Ministers of Education, 1993) provided the guiding framework for the provincial curriculum development. It is this participant's view that the vision outlined in this document was not made clear to him/her during the process. Another participant had a differing view concerning this issue. It was that the development team was not expected to contribute to a vision for the curriculum, but to adapt the vision of the *Pan-Canadian Framework of Science Learning Outcomes K-12* to the local provincial context. The team was not expected to

contribute to a vision because there were already other K-12 teachers involved nationally through committees which had oversight in the *Pan-Canadian Framework* design.

Another participant reflected on the energy it took to undertake a project such as this. S/he stated that, “Maybe I ran out of steam and had lost some creativity. It was a long process...I was involved in this for a couple of years...Maybe I ran out of ideas” (Participant, personal communication, March, 2014).

A fourth participant reflected on what s/he valued in what a curriculum document should represent. S/he stated that, “You try to influence the curriculum in a way that you feel is most significant for, not for my voice, but wanting it to be representative of what I thought would be valuable for students” (Participant, personal communication, March, 2014). A fifth participant reflected on the value that the experience had for him/herself as an individual and his/her professional growth. S/he stated that, “Just meeting with each other and talking about chemistry. I think a lot of face to face is really good. There are lots of storytelling and sort of like ‘Well I do this’ and ‘Oh I picked up this’ and it’s that sharing of experiences that really helped the growth of this document” (Participant, personal communication, March, 2014).

### **5.5 Section Summary**

The above section presented the experiences of the stakeholders involved in the curriculum construction process. It presented a range of experiences by organizing them into emergent themes. These themes included perceptions that some participants felt that some stakeholders were reluctant to consider other points of view, some stakeholders were undervalued, there were some stakeholders that had more control than others, and the importance of writing pedagogy into specific learning outcomes. These themes caused some tensions among the participants. Other themes that emerged from the data included the development team having

a noteworthy presentation event which argued for the inclusion of a traditional Atomic Structure unit in the curriculum (and this then being supported by the development team), and that the development team worked well together. Lastly, a range of interesting individual experiences was presented.

### **5.6 Stakeholders' Views of the Curriculum Construction Process**

The section that follows presents the thoughts and feelings of the stakeholders as they reflected on the curriculum construction process. It reveals their opinions about the final product—the curriculum document. Again, overarching themes emerged from the data in terms of types of recollections. Each theme is presented below with supporting quotes and explanations for each. This section starts off by outlining what the stakeholders viewed as missed opportunities. These were (1) the inclusion of chemistry learning theory, (2) including a variety of stakeholders, (3) making the curriculum different from the last one, and (4) having a clear overall vision. It then presents other themes such as feelings of disappointment due to length of publishing time and questioning whether the document had any real impact. Furthermore, other themes presented include the perception that the curriculum improved upon the previous curriculum, the curriculum construction process as great professional development, and that the document provides a ground for the further professionalization of teachers. Finally, this section ends with various suggestions from the stakeholders, based on their experiences and view of the curriculum construction process.

#### **5.6.1 The inclusion of chemistry learning theory as a missed opportunity.**

A first minor theme that came to light from two participants' interview data was that they felt that more chemistry learning theory could have been emphasized throughout the document. As revealed in the document analysis, there is reference to the Johnstone model (1993), only it is not explicit. The model is described using different language than the Johnstone (1993) model

uses. One participant saw it as a missed opportunity “by not building upon chemistry learning theory at the front of the Chemistry document. [The front end of the document] speaks more in science generalities than [it] does in speaking about chemistry generalities. I thought the writer would have written about Johnstone's model and Mahaffy and stuff like that, but [s/he] chose not to write about that” (Participant, personal communication, March, 2014). Another participant looked back on the process and saw this as a missed opportunity as well. S/he said that:

There was at least one person...that they really wanted to take advantage of the opportunity and make something really different. I don't think that most of the team was entirely in agreement with that person which in retrospect was our loss. In some cases, I didn't think that [the province's] teachers were ready. Ready for something drastically different...I seem to recall there being discussion about we had to recognize that it had to be presented to [the province's] teachers and be something that [the province's] teachers would accept” (Participant, personal communication, March, 2014).

S/he inferred that there may have been some difficulty trying to sell something that new and unique to the province's teachers. If development team members, as teachers themselves, were not ready for the new ideas, how could they expect the teachers that they represented to do so? By so doing, it would appear that teachers on the development panel were not only seeking their own interests, but also seeking the interests of their compatriots in schools.

### **5.6.2 Including a variety of stakeholders as a missed opportunity.**

As second minor theme, that unfolded from two participant interviews, was another form of missed opportunity; that is, involving a variety of outside stakeholders in the process. One participant suggested that, “There should have been more input from more stakeholders...In terms of industry and academics” (Participant, personal communication, March, 2014). Another participant also suggested that there should have been “other members of society like pharmacists” (Participant, personal communication, March, 2014). This participant also explained that the team would have had a far better sense of what the needs were, before they

started, if they consulted more outside stakeholders. S/he felt quite disturbed looking back on the process, that it did not involve students, parents, principals, visible minorities, and Aboriginal perspectives. S/he explained:

Why didn't we ask students what they thought? That's a huge missed opportunity because sometimes we were like, 'Oh, we know what we're doing, we're teachers.' But what are their needs? What about parents?...What about principals?...All kinds of different people...What about minorities? There was not one visible minority...Aboriginal perspective? There was none." (Participant, personal communication, March, 2014).

As a means of providing perspective to this issue outlined by this participant, Aikenhead (2000) examined the *Pan-Canadian Framework* process and explained that certain stakeholder perspectives were not represented in that process either. He explained that:

In keeping with Canadian culture, the *Common Framework of Science Learning Outcomes* (the *Framework*) evolved through negotiation and compromise among provincial bureaucrats, advised by interested parties (stakeholders) in each province. This political process, however, did not meet the standards of curriculum policy development held by the Canadian science education academic community...The academic science educators' discontent can be attributed to the fact that an earlier national science education policy project, funded and directed by the Science Council of Canada (SCC, 1984; Orpwood, 1985), had painstakingly conducted its education study with the highest of scholarly standards (Aikenhead, 2000, p. 51).

The Science Council of Canada's study had organized many conferences with many stakeholders representing a range of views. It was done in a way that allowed for structured, but open deliberation. According the Science Council of Canada, the *Pan Canadian Framework* process was mostly bureaucratic and did not invite the views of nearly as many stakeholders. For the development of this particular province's curriculum, the development team was tasked with translating the *Pan-Canadian Framework* into a local, provincial version of it. One participant explained that the *Pan-Canadian Framework* process was tightly controlled by the Canadian

provinces, and if a multi-stakeholder view was not present in that process, would one expect it to be in the local, provincial process?

### **5.6.3 The curriculum is not much different than the last one.**

A third major theme that transpired from four participant interviews was the view that the 2013 curriculum is not much different than the 1998 transitional document. One participant explained that when working on the curriculum, it seemed quite fresh. Looking back on it now, s/he realized perhaps it is not. S/he stated that, “It seemed like it was new at the time even though, maybe it wasn't” (Participant, personal communication, March, 2014). A second participant explained how the 1998 document was used as a starting point, but ended up pretty much dictating the product of the 2013 document. S/he said that, “We used [the 1998 transitional curriculum] as a starting point to try to come up with something different but turns out that the existing curriculum is not all that significantly different than the transitional document” (Participant, personal communication, March, 2014). This participant then admitted that some stakeholders wanted to try something different, with the inclusion of an investigative chemistry unit, but just could not come up with something that the team was satisfied with. S/he portrayed his/her disappointment by saying that, “We were a little disappointed that it wasn't as different as we thought it would be. I know that we try to do things with the document but we couldn't figure out a way to do it” (Participant, personal communication, March, 2014). Another participant explained that maybe the reason it felt different at the time is because they were making many physical changes to the structure of the document. S/he explained that, “We were just making minor cosmetic changes. Again, that's what kind of makes me feel that Chemistry 12 didn't have that much impact. And not that it needed a lot, it just felt like a lot of it was not going to be new or much different” (Participant, personal communication, March, 2014). A fourth participant

generalized the fact that curriculum has not really changed that much over the decades (not even compared to the 1998 transitional document). S/he said that, “We still have a long way to go in terms of making chemistry education as it happens in the classroom look like something that still isn’t a lot like the 1950’s or the 1960’s” (Participant, personal communication, March, 2014).

#### **5.6.4 Absence of clear overall vision.**

Four out of eight participants interviewed said there was an absence of clear overall vision in terms of the goals for the curriculum document, making this another important theme. In retrospect, four participants realized this lack of clear overall vision as an element of retrospection on the curriculum document product. Two participants questioned whether the development team actually met the goals they had set out to achieve. One of them saw it as someone else setting the big picture goals, and then it was the development team’s job to fill in the rest. He/She said that, “I was just wondering if we had met the goals that [were] set for the development of this new curriculum - did we do the job that they were hoping for?” (Participant, personal communication, March, 2014). This comment indicates that indeed, the overall vision was not made clear to this participant at least, because after the process was completed, s/he was wondering whether they met the goals that somebody else had set. Two other participants described the process the team engaged in as being problematic. One of these participants confirmed the fact that the development team mostly focussed on scope and sequence of content for the curriculum. S/he said that:

When I started I was thinking more about the content areas than knowledge of chemistry that students need to know rather than focusing on, what is chemistry? It would have been better to focus on some general learning outcomes that we believe students should know and then fit the specific concepts into those, as opposed to the opposite way where we tried to figure out a bunch of specific learning outcomes (the content) and then tried to align the general learning outcomes with those...I feel like we did that a bit backwards” (Participant, personal communication, March, 2014).

### **5.6.5 Feelings of disappointment due to length of publishing time.**

The participants, in half of the interviews expressed feelings of disappointment because the document took a considerable time to be published. This emerged as a major theme in this section. As explained in Chapter One, this was the reason that initially motivated this study for myself as the researcher. That is, the document seemed to take an excessive amount of time to be officially released. One participant said that, “It makes me kind of disappointed that it would take this long” (Participant, personal communication, March, 2014). Many of the participants questioned the relevance of a document today, when the bulk of the development phase took place years ago. Another participant brought up the point that, “Things have changed a lot in ten years” (Participant, personal communication, March, 2014). It is important to note that the reason for the abnormal length of time from curriculum development initiation to publishing did not emerge from the data.

### **5.6.6 The impact of the document.**

Another theme that arose from the data was whether the released document even had an impact on the province’s chemistry education. There were four participants that talked about this, making it another major theme. One participant reflected on the idea of the busy teacher who gets a lot of mail and ultimately it is the teacher themselves who chooses to embrace something like a new curriculum document. The participant explained that, “It's rare that [the classroom teacher] will see something [new] or by the time the principal sends it down to you, it's really old or you don't even open it or if it's a letter from the department, you just kind of toss it” (Participant, personal communication, March, 2014). This participant went on to say that the curriculum is just a document, and how much impact can only a written document really have? S/he stated, “I think that the missed opportunity is really at the point of how we en-act

curriculum, it's just a document. I think we can make better documents but it's never going to solve all the problems" (Participant, personal communication, March, 2014). Another participant echoed this idea by asking, "Who knows if anyone is taking the shrink wrap off? Who knows if anybody has actually gotten than from the department? I mean it was just a sheet of paper" (Participant, personal communication, March, 2014). Because of this, another participant asked, "[I'm] wondering if this new curriculum is going to be significant to anyone?" (Participant, personal communication, March, 2014). This participant then compared this document to the Grade 11 by saying, "I felt the Chemistry 11 process was more effectual than the Chemistry 12 process. I was disappointed that I didn't think we had as much impact" (Participant, personal communication, March, 2014). A fourth participant saw this as a missed opportunity to do something different and significant. S/he explained that:

I think we missed a chance to do something really cool...For me personally, I don't think I was at the place or at the time to be able to do that...My philosophy of chemistry education was a little bit different than what it is now. [The curriculum could have been] something cool, something really different, something unique" (Participant, personal communication, March, 2014).

S/he looked back and realized that at that time, his/her overarching philosophy of what s/he thought chemistry should be was not well-defined, or at least not open to other broader considerations. Because of that, s/he felt s/he was not ready to create something really different.

#### **5.6.7 The curriculum improved upon the previous curriculum.**

One minor theme that emerged from two participant interviews was that they felt that the curriculum still made some new inroads, and improved upon the previous curriculum. One participant commented on even the international significance of the province's Chemistry curriculum. S/he explained that:

[The province's] curriculum [is] really quite fresh even internationally...[The] Modes of Representation was intended to be something that was important. So that's looking at things observationally, numerically, graphically, and symbolically. Of course the whole role of algorithms in the Chemistry curriculum underwent rather a reconstruction and a reinterpretation so that mathematics would be no longer be seen to be the sole reason why students are in a chemistry classroom. That was a fundamental change and at the time, it was a controversial change. I think it's terribly important for any chemistry educator to be able to get a sense of where some of those new directions and orientations have taken us (Participant, personal communication, March, 2014).

This participant referred to the "Modes of Representation" (Provincial Education, 2013, Section 2 p. 18) expressed in the first half (the introduction section) of the document. This section was also revealed in the document analysis as something that influenced the document. A second participant also referred to this teaching approach by talking about the Johnstone (1993) model. S/he extended this idea of including this instructional model directly in the outcomes themselves. S/he said that, "[The Johnstone (1993) model] certainly wasn't in that transition document and there were no other curricula that were putting it into the outcome language. As far as I know we were one of the first to use that model as part of our curriculum or the basis of our pedagogy" (Participant, personal communication, March, 2014). This person went on to generally conclude that, "[The 2013 curriculum] is better than the transition document...The transition[al] was a huge improvement on what we had before that and this document was an improvement upon the transition document. So it's better than what we had" (Participant, personal communication, March, 2014).

#### **5.6.8 The curriculum construction process as great professional development.**

When looking back on the curriculum construction process, three participants commented that being a part of the process was some of the best professional development they have had. This emerged as a minor theme. One participant said that, "Participating in those committees was so enriching and informed my practice...on-going professional development to me is the key to

any real change” (Participant, personal communication, March, 2014). This person also explained why s/he thought it was such good professional development. S/he said that, “I think it's the best possible professional development that you can have because it is long-term, regular, you have all of this time” (Participant, personal communication, March, 2014). S/he explained further that, “It's a lot more valuable for those who participate in the process than for those who just get the documents” (Participant, personal communication, March, 2014). S/he reflected on another reason that supported the notion that curriculum development functions as great professional development. S/he said:

I think in education in general is how do you structure that time so that teachers can meet and think about their practice and have their practice evolve...I think teaching especially at the high school level is a very isolating activity where you're in your classroom, you don't necessarily have a lot of opportunities to talk about things other than talking about particular students, and you don't necessarily talk so much about the content of courses, the pedagogical aspect of courses. When you're in a curriculum development committee, that's what you're talking about. You don't have the same students so you talk less about those individuals and more about what you're doing [and] how you're doing it” (Participant, personal communication, March, 2014).

Another participant described this professional growth in terms of self-reflection. S/he said that, “It really helped the growth of the teachers involved because then you look at your own classroom activities and you go ‘Oh yeah you know what? Maybe I would like to do this. Maybe I would like to do that.’” (Participant, personal communication, March, 2014). Another participant explained this as an opportunity to add the ideas gained from the experience to his/her teaching tool-belt. S/he said that, “I learned a lot just about the content and ideas and how to teach things, and some of them [I] have been teaching it for fifteen, twenty years... You develop a lot of resources over these years so that was really good from the professional standpoint” (Participant, personal communication, March, 2014).

### 5.6.9 Professionalization of teachers.

Another minor theme that emerged from three participant interviews was the importance to leave the curriculum document open enough to allow for teachers to make decisions within their own contexts. This promotes for the further professionalization of teachers. One participant explained that, “There is openness in that curriculum for a teacher to do pretty much pedagogically what they want...It’s in the hands of teachers now. They have to decide what they’re going to do with it” (Participant, personal communication, March, 2014). Another participant explained the importance of understanding the foundations of chemistry education in the province, in order to interpret the specific learning outcomes. At the same time, s/he commented that they did not want to prescribe how students should achieve the outcomes. S/he said that:

At that time, it was all-important right from the outset that you have prescribed learning outcomes, but of course you can in no way prescribe the manner in which those outcomes are going to be achieved by students. That’s important for the standpoint of continuing professionalization of science teachers. It’s for them to know that they have that freedom. That’s why the front-end of curriculum documents in [the province] is vitally important for our teachers to read and appreciate and I suspect that such sections are widely read among teachers. This is not just some type of idle, standard drivel that takes place. [This province] has an orientation to Chemistry curriculum unlike any other province in the country, and you would not know that if you only looked to the specific outcome statements. You would have to dig deeper to be able to understand and appreciate the actual foundations of chemistry education in [the province]” (Participant, personal communication, March, 2014).

A third participant wrestled with the idea that the curriculum should give enough information, but not dictate what should happen in the classroom. S/he said that, “You need to find that balance between giving enough information for teachers to be comfortable as to where they’re going but not so much that it feels forced, that they feel constrained” (Participant, personal communication, March, 2014).

### **5.6.10 Recommendations/Improvements.**

A last theme that emerged from six of the participant interviews was improvements or recommendations for the curriculum development process. They felt collectively that these were things learned from this experience that can be applied to other curriculum development processes. One participant reflected on the importance of using research to steer the development process. S/he said that, “It needs to be done in a research-based manner and not repeat the mistakes that have been going on” (Participant, personal communication, March, 2014). A second participant commented on the leadership qualities needed for a curriculum construction. S/he explained that, “That person leading the group doesn’t have to be a teacher, doesn’t have to teach chemistry at all. That person should be the process [oriented person], the leader of the *process*. Make sure that the process is respected. So that person could consider everything about who is around the table and why” (Participant, personal communication, March, 2014). This participant felt that in the case of the development process for the 2013 curriculum, the process was rushed and in turn was not completed properly, primarily because of a lack of consideration for an informed process.

Three participants commented on the time given for the process. One participant suggested the idea to have team members focus on the curriculum over large periods of time, rather than having lengthy interim periods of time between meetings. S/he said that:

The biggest challenge is teacher release time and so that you can maintain momentum on the project. It would be far better in my estimation to have seconded the teachers out of the classrooms for about six weeks and worked daily...Having an intensive and very compressed experience would have been something that would have been preferable to me...This is just too great a length of time for teachers to be out of the classroom understandably. So it begs the question, would this have been something that could have been done in the summer for example?” (Participant, personal communication, March, 2014).

Another participant agreed by saying that, “I would have preferred a chunk of time away from the class all at once” (Participant, personal communication, March, 2014). A third participant took this idea of time in another direction. S/he would have preferred more time away given by the school division. S/he said that, “[I wish we were] given more time by our own school division” (Participant, personal communication, March, 2014).

A participant suggested that the Grade 11 and Grade 12 curriculum be developed together, instead of separate processes. S/he said that, “That would’ve probably been a better way to go all way through Grade 11 and Grade 12 with a more balanced approach” (Participant, personal communication, March, 2014). This person, and another participant, commented on another issue. One participant commented that one of the writers entered the process part way through and had an understanding that “You could not change an SLO [specific learning outcome]” (Participant, personal communication, March, 2014). Another participant felt that one of the curriculum writers was not a part of the committee. This participant said that:

[One of the] curriculum writer[s] was not part of the committee. That person sat in some of the meetings but that person was not part of the committee...Some of the spirit what we wanted the document to look like was not in the document itself because that person wasn’t there for most of the discussions and most of the intent behind things (Participant, personal communication, March, 2014).

Another participant had an interesting idea for the existence of the document. With technology, the curriculum does not have to be a static paper document. This participant noted that the curriculum can be a living document that can constantly be changed and updated. S/he commented on the benefit of being able to add more particulate dimension (Johnstone, 1993) content to the curriculum. S/he said that, “I would like to have this document have life so you can go in and change things and add more particulate [molecular level] once you come across things” (Participant, personal communication, March, 2014). This participant also commented on

the importance of marketing the curriculum, once completed. S/he suggested a “better marketing plan...It wasn’t marketed as a document. There was never a complete package” (Participant, personal communication, March, 2014). A fifth participant expressed a suggestion about the assessment of this curriculum. S/he said that:

We could have done a better job influencing the assessment process...I don’t know we ever really spent much time with the assessment side and looked at the big picture of how chemistry was going to fit into the provincial assessment process and maybe if we knew that five years down the road, they were planning an overall assessment of the Chemistry 12 students (Participant, personal communication, March, 2014).

A sixth participant suggested a major paradigm shift that s/he feels should happen in chemistry. Rather than focussing on content students will see in university, the curriculum should focus on positive experiences that truly engage the learners. S/he explained this by saying that:

I don’t see why chemistry at the post-secondary level should be simply a repetition of all the conceptual bases that was a part of Grade 11 and Grade 12 Chemistry. So we have to find the way to have those broader levels of satisfaction without appearing to compromise even that 5% who might need a very traditional approach to something like chemistry within their curriculum versus the vast majority who clearly don’t, but might also be looking for a really enriching and engaging experience, something that might hold on to them in such a way that the very positive remembrances about the experiences that they had as a student. And be able to recommend something like chemistry education to those around them or their own children because their experiences were positive and not necessarily directly applicable but it was able to teach them something about the importance of chemistry, which is everywhere, both within themselves, their bodies as a group, and everywhere” (Participant, personal communication, March, 2014).

The above section outlined ten themes that emerged from the interview data about how the participants looked back at both the process and product of the curriculum. There are a variety of types of thoughts and emotions. Missed opportunities, underlying questions about why certain things were done, positive points about the project, and suggestions were all explored. The next section presents the themes that emerged from the data about the nature of participants rethinking their pre-conceived notions of chemistry education.

## **5.7 Stakeholders Experiencing a Transformation**

The data in this section presents evidence of any deconstruction and/or reconstruction processes experiences during the curriculum development process. For stakeholders that experienced this, the data revealed themes as to the nature of this process. That is, some characteristics of the process are presented. It is obvious that the way the process unfolds can be very different for different people. The following outlines the nature of any process(es) the participants experienced within this bounded case of the design and development of the *Provincial Grade 12 Chemistry Curriculum Framework (2013)* curriculum document.

The data collected reveals two themes that help characterize the nature of individual deconstruction/reconstruction processes via many participants. Section 5.7.1 describes that stakeholders needed time for reflection, and Section 5.7.2 describes that the process is influenced by stakeholders working together regularly. These two characteristics emerged from multiple participants.

The last section of this chapter, 5.8, presents data from a single participant's process of deconstruction/reconstruction. S/he was able to provide rich and insightful data which describes how it unfolded for him/her.

### **5.7.1 Stakeholders needed time for reflection.**

A first major theme that arose from the data was that the stakeholders needed time to reflect on their notions of not only chemistry, but in some cases, teaching in general. Three participants described this reflective process. The remaining five participants did not acknowledge or seem to experience a process of transformation. A first participant described the initiation of a process of deconstruction/reconstruction. S/he said that, "The curriculum development process makes you think more about what you're teaching and why you're teaching

and then it starts. It just starts you asking questions” (Participant, personal communication, March, 2014). This person suggested that the curriculum process was a catalyst for questioning oneself. This participant went on to say that, “It’s through a variety of experiences and reflecting upon my teaching... That’s just part of your growth” (Participant, personal communication, March, 2014). A second participant simplified the reflection process by saying that, “You look at your own classroom activities and you go, ‘You know what, maybe I like to do this. Maybe I like to do that.’” (Participant, personal communication, March, 2014). A third participant said that, “The process kind of makes you understand that there are so many factors involved in curriculum development, so many different pressures... you really need to be a reflective practitioner” (Participant, personal communication, March, 2014). S/he went on to say that, “It really changed my view of what it is to teach and what is important about teaching: that time to think about your practice” (Participant, personal communication, March, 2014). S/he expressed the need to think about one’s own practice. S/he said that, “You can always evolve but you need that time to think about it and the will to think about it” (Participant, personal communication, March, 2014). This participant related the curriculum process to the big picture understanding of the different factors influencing the process, and what it means to teach in general, not just what it means to teach chemistry.

### **5.7.2 Teachers working regularly together.**

A second major theme that emerged from the interview data referred to the importance of teachers working together regularly in order to foster a process of deconstruction/reconstruction. There were four participants who experienced some sort of shift of perspective in terms of their teaching. Three of these four participants talked about the regular schedule contributing to their changing views. One participant said that:

The key to me is not the curriculum document but it's the professional development and not those one day kind of, 'Hey, here's how you should be teaching chemistry.' It should be more, teachers working together regularly to talk about their practice, to talk about what they're doing, how it's working [and] how students are reacting to it. (Participant, personal communication, March, 2014).

Another participant said that:

I was more inspired by the people around me who were involved in the curriculum development. I think it was not so much generalities, but specifics...Different teachers had different approaches to a unit and different teachers with different approaches to teaching it. I found myself always thinking, 'Oh well, I never thought I'm doing it that way.' Or 'Oh wow, that's great idea, I should try that' (Participant, personal communication, March, 2014).

A third participant mentioned that some stakeholders entered a process of perspective shift without even necessarily expecting to, due to the curriculum development process. S/he explained that:

Some have their colleagues' opening their eyes to a whole new set of ways of looking at the teaching and learning of chemistry that they otherwise might have really had no opportunity to do had they not been presented with something like the development of new curriculum...Watching their positions evolve and change by virtue of being surrounded by other opinions, other inclinations, other reasons for the learning of chemistry that they might not have even thought of prior to going into the process of actually developing curriculum. And that aspect of being involved on the development team is probably, in my estimation, the most rewarding. The manner in which talented teachers themselves undergo an educated process and begin to look more closely at their own teaching. There's no replacement for having an opportunity like that in my experience and that's one of the better outcomes from a good functioning development team, is that you actually see changes starting to take place in the teachers, in a way that they grow comfortable at times, it's almost akin to the establishment of new family relations" (Participant, personal communication, March, 2014).

### **5.8 Presenting an Interesting Participant Case**

There was one unusual transformational process that no other participant similarly experienced or described. S/he provided a rich description of the process s/he experienced. S/he seemed to experience this due to, at least in part to, the curriculum development process itself.

The following presents the data from one participant who was able to describe in detail, his/her journey throughout a process of deconstruction/reconstruction. Firstly, this participant described how s/he was able to define his/her own personal philosophy about chemistry education. Once s/he did this, s/he defined the pedagogy involved in portraying this philosophy. S/he said that:

You have to think about what chemistry education is to you and then you have to fit that in to a curriculum, and then you have to think pedagogically...It made me think more about my philosophy of chemistry education (Participant, personal communication, March, 2014).

S/he reflected on his/her previous notion of chemistry education. Basically whatever what was in the textbook defined why, what, and how it was to be taught. S/he explained this by saying, "I never really spent a lot of time asking the question why I am teaching it, it just seemed like standard textbook knowledge and so that's why we teach it" (Participant, personal communication, March, 2014).

Secondly, this participant described how once s/he outlined his/her own philosophy and pedagogy, s/he put it into classroom practice. S/he described this by saying that:

When you're removed from it [the curriculum construction process] and you're trying to teach it [the curriculum] and then you're starting to ask the questions that you may not have when you're in the middle of it" (Participant, personal communication, March, 2014).

For this person, this was not a linear process. Once in practice, s/he would have to either address new questions that came up from applying it in the classroom, or re-visit initial questions about his/her philosophy and/or pedagogy.

Next, this process sprung up more questions for this participant. S/he described it as coming to a real point of dissatisfaction before any real change could occur. S/he explained this process using an actual example of something that occurred within the 2013 curriculum construction process. S/he said that:

After [the curriculum development process] I started asking the questions, ‘Why are we teaching this?’ and then you send out an e-mail out to the rest of the committee members a year or so later and ask the question, “Do you remember why we put this from the curriculum?” and nobody could really answer the question why it’s there...Nobody could really come up with the reason why...[As an example] the only reason [for] balancing equations is to do stoichiometry, and we don’t do any stoichiometry with redox so, why do we have it there? Nobody could really answer that question (Participant, personal communication, March, 2014).

Lastly, this participant went through a time of realization—a realization that s/he was at a different place when engaging in the curriculum process. S/he said:

It just seemed like a good idea at the time. When you start going through the curriculum and ask the question about, ‘Why did we do this?’ ‘Why do we put this in there?’ It just seemed like the right thing at the time. When we go back and start asking those questions why and we realize...[Well let’s just say] there are things in there I don’t teach [now]” (Participant, personal communication, March, 2014).

This participant explained this deconstruction/reconstruction process s/he experienced by using an analogy. S/he explained that:

It’s kind of like when you build a house. You walk into that house and you’ve made the plans and everything like that. You walk into the house and you start walking around, and you figured to yourself, ‘This hallway really didn’t work, it seemed like a good idea at the time. I thought it would work, but in actual practice, not so much. So if I were to do this again, I would do this.’ So based upon my experiences and how my life changes, I probably wouldn’t do this again. It all seemed based upon our ideas of what chemistry was and what a curriculum would look like. It seemed like a good idea at the time (Participant, personal communication, March, 2014).

## 5.9 Chapter Summary

Chapter Five has reported and analyzed the data from the participant interviews. It also drew some connections between the document analysis of Chapter Four and interview data. It presented the data in a narrative approach, bringing out the individual differences and perspectives of the participants. Data was organized into emergent categories. There are four overarching categories that the data was sectioned into: Section 5.2 was the influences on the

2013 curriculum, Section 5.4 was the experiences of stakeholders, Section 5.6 was the stakeholders' views of the curriculum construction process as a whole, and Section 5.7 reported the stakeholders that experienced a transformation. Within each of these over-arching themes, there were sub-themes that emerged within these. These sub-themes were described at the beginning of each section. In the chapter that follows, Chapter Six, findings of the data specific to the research questions are discussed.

## Chapter Six: Discussion

### 6.1 Introduction

This thesis has explored the human activity and dynamics associated with the curriculum construction process. Specifically it has explored the factors that influenced the curriculum, the lived experiences of the stakeholders, how the stakeholders look back on the curriculum process and product, and the nature of any deconstruction/reconstruction processes they endured. In this chapter, Section 6.2 gives an overview of the entire study. Section 6.3 answers and discusses research question one, the factors that influenced the 2013 curriculum. It also analyzes and discusses each of the factors identified through document analysis and participant interviews. Section 6.4 answers and discusses specific research question two, the lived experiences of the stakeholders involvement and 6.5 answers and discusses specific research question three, how the stakeholders looked back on the process and product. Section 6.6 answers and discusses specific research question four, the nature of the deconstruction/reconstruction processes stakeholders endured. Section 6.7 discusses a minor research question that arose from the data analysis. Section 6.8 provides a section summary about the discussion of the research questions overall. Lastly, Section 6.9 discusses the implications of this research, and 6.10 provides a chapter summary for the discussion.

### 6.2 Overview of the Study

This thesis's purpose has been to outline the human dynamics involved in the construction of the *Provincial Grade 12 Chemistry Curriculum Framework (2013)* written/formal curriculum document. It has explored the "marble cake" (Bell, Carr, & Jones, 1995, p. 99) that typically results in a curriculum as a result of many different influences. It has explored Pinar et al.'s (1995) insight that, "[Curriculum] is intensely historical, political, racial,

gendered, phenomenological, autobiographical, aesthetic, theological, and international” (p. 847). The study has revealed a “fuller explanation of the curriculum developers’ knowing stance and interest” (Aoki, 1978, p. 414). The study has achieved this by identifying the main factors that influenced the design and development of the curriculum document, exploring the lived experiences of the stakeholders during the curriculum construction process, revealing how the stakeholders look back on the curriculum process and curriculum product (the curriculum document), and by outlining characteristics and possible stages as a part of the nature of any deconstruction/reconstruction processes the stakeholders endured.

The general research question is:

What were the human dynamics involved in the design and development of the *Provincial Grade 12 Chemistry Curriculum Framework* (2013) written/formal curriculum document?

The specific research questions are:

- (1) What were the main factors that influenced the construction of the document?
- (2) What were the lived experiences of the stakeholders involved in the construction process from conceptualization through to implementation?
- (3) In retrospect, how did the stakeholders look back at the process and the product?
- (4) What is the nature of any deconstruction and/or reconstruction processes the stakeholders experienced?

This thesis is a descriptive case study, in which rich details of the case were provided.

The goal has been to provide an in-depth understanding of the human processes involved in the creation of the *Provincial Grade 12 Chemistry Curriculum Framework* (2013) curriculum document. This single “instrumental case study” (Stake, as cited in Creswell, 2013, p. 99)

provided multiple sources of information to create the description of the case. Document analysis and interviews were carried out. The focus has been on one concern (the human dynamics involved in curriculum construction) through one bounded case (the design and development of the *Provincial Grade 12 Chemistry Curriculum Framework* (2013) curriculum document) to illustrate the issue.

The document analysis was carried out using two main theoretical lenses, foundations (Ornstein & Hunkins, 2009) and orientations (Eisner, 1979) to curriculum. Contact was established with the fifteen people who were directly involved in the curriculum construction process. Contact was made with every person who was seen to be directly involved by snowball sampling (see Methodology section). Eight out of the fifteen participated and interview data was collected. This case involved the perspectives of many people in the production of one official document.

### **6.3 Discussion of results to answer research question (1)**

(1) What were the main factors that influenced the construction of the *Provincial Grade 12 Chemistry Curriculum Framework* (2013) written/formal curriculum document?

Through the analysis of the *Provincial Grade 12 Chemistry Curriculum Framework* (2013) written/formal curriculum document and participant interviews, there were twelve factors that influenced the curriculum document. In turn, the factors that influenced the 2013 curriculum document were the *Pan-Canadian Protocol*, the *Provincial Grade 12 Chemistry Transitional Curriculum Framework* (1998), the content-emphasis for the curriculum, the view to prepare students for university, the desire to mandate more lab activities, the desire to make the document user-friendly, the influence of the microscopic/particulate level of understanding, political influences, the lack of resources available, the curriculum development model used, the

variety of perspectives involved in the process, and the absence of a clear overall vision for what the curriculum should accomplish.

The factors that influenced the curriculum include a mixture of historical, social, psychological, and philosophical foundations (Ornstein & Hunkins, 2009); and orientations of curriculum, mainly academic rationalism and the development of cognitive processes (Eisner, 1979). There are twelve specific factors identified that influenced the curriculum document. Under each factor, there are other unusual, interesting, and provoking insights that are outlined. Some insights emerged from multiple participants, some from just individual participants. There are valid insights and worth presenting in this section, as they propose further critique and/or insight into the curriculum construction process.

### **6.3.1 The *Pan-Canadian Protocol*.**

The influence of the *Pan-Canadian Protocol* was evidenced in both the document analysis and interview data. This factor is a historical and social foundation to curriculum (Ornstein & Hunkins, 2009). This supports Pinar's (1995) notion that curriculum is quite "historical [and] political" (p. 847). In Canada, The *Pan-Canadian Protocol* became the overarching philosophy of the 2013 Chemistry curriculum. Initially the protocol was released in 1993 and used as a framework for the 1998 transitional curriculum. Many foundations from the 1998 transitional were brought over to serve as foundations for the newer 2013 curriculum. Namely, this overarching philosophy is described well in the first half of the 2013 curriculum document and in the general learning outcomes. On the other hand, the interview data revealed that participants stated that the *Pan-Canadian Protocol* had an influence on the curriculum, but at the same time did not really define what the team was working towards. Ornstein and Hunkins (2009) explain that historical foundations "helps us integrate curriculum, instruction, and teaching...better understand the relationship between content and process...[and] understand

relationships between what students of the past learned and what students now learn” (p. 70).

This was done in some regards in the writing of the first half of the document, but did not inform the team as they approached the development of the specific learning outcomes. Second, the *Pan-Canadian Protocol* defined the potential social foundations for this curriculum in that it laid the ground work for an overhaul of all science curricula in Canada. Societal influences prompted the development of the *Pan-Canadian Protocol*. This document then made its presence known in the province, and it was possibly assumed that the province would restructure its future entire science education curricula around it.

### **6.3.2 Provincial Grade 12 Chemistry Transitional Curriculum Framework (1998).**

Although the *Pan-Canadian Protocol* had the potential to strongly influence the new provincial Chemistry curriculum, the transitional 1998 Chemistry curriculum, surprisingly, was likely a greater source of influence. This supports Pinar et al.’s (1995) notion that curriculum is “intensely historical” (p. 847). Through the comparison of the transitional 1998 with the completed 2013 curricula, it is clear that this historical foundation (Ornstein & Hunkins, 2009) greatly influenced the 2013 curriculum. That is, many underpinnings originated from the 1998 transitional document. These document analyses were presented, together with the participant interviews, to triangulate data to help answer the first specific research question. Underpinnings and content were both brought over from the 1998 transitional document to the 2013 document. The curriculum team had a pretty good idea recognizing what worked and what needed improving from the 1998 document. It appeared that the team “[found] specific traditions that [were] good and then [saw] that these traditions [were] strengthened and used” (Doll, 1986, p. 117).

### 6.3.3 Content-emphasis in curriculum.

This factor that most strongly influenced the 2013 curriculum is based on an essentialist philosophical foundation (Ornstein & Hunkins, 2009) or, similarly, an academic rationalism (Eisner, 1979) orientation to curriculum. The heavy emphasis on content indicates that this was what was valued and privileged among the development team, largely marginalising the endorsements of the *Pan-Canadian Protocol*. Although the *Pan-Canadian Protocol* apparently informed the background to the curriculum, the specific learning outcomes were influenced otherwise. Specifically, these outcomes reflect an essentialist philosophical foundation (Ornstein & Hunkins, 2009). This is a conservative approach to chemistry, which values facts and knowledge. What differentiates this from the perennialist philosophical foundation is that problem solving is also emphasized (Ornstein & Hunkins, 2009). The problem solving is quite evident throughout the 2013 document. The academic rationalist orientation (Eisner, 1979) is similar in that it is subject-based. That is, the content comes from within the discipline itself.

One participant was asked why students should do lab activities. S/he indicated that the point was to learn chemistry content. On the other hand, doing a lab activity can open the door for other orientations like personal relevance and cognitive processes (Eisner, 1979), for example. In other words, another goal of a lab can be to relate a chemical concept to a student's life or develop their thinking capabilities. This response by the participant indicated the limited orientation view of the purpose of a lab—a focus on purely enhancing the content knowledge of chemistry. This academic rationalist (Eisner, 1979) approach is also evident in the content associated with the majority of the specific learning outcomes and in the “Appendices” (Provincial Education, 2013) section of each topic of the curriculum document.

#### **6.3.4 Preparing students for university, the curriculum needs more labs, and the document needs to be user-friendly.**

These three factors fall under the umbrella of the large philosophical essentialist foundation (Ornstein & Hunkins, 2009)/academic rationalist orientation (Eisner, 1979). These were specific examples that emerged from the interviews and document analysis that support the notion that the essentialist philosophical foundation (Ornstein & Hunkins, 2009)/academic rationalist orientation (Eisner, 1979) was an overall factor influencing the curriculum development process.

When the participants were asked what the development team interpreted as what preparing students for university means, they indicated that students were exposed to the content they would encounter in first year university. This interpretation strongly underscores a philosophical essentialist foundation (Ornstein & Hunkins, 2009)/academic rationalist orientation (Eisner, 1979). This provides supporting explanation as to why the second half of the curriculum document has such a heavy essentialist foundation (Ornstein & Hunkins, 2009)/academic rationalist orientation (Eisner, 1979) emphasis.

Second, the participants' desire for the curriculum to mandate more lab activities was another factor that influenced the curriculum. This falls under both of Eisner's (1979) curricular orientations of development of cognitive processes, and academic rationalism. Some participants saw labs as helping students understand content, but some participants viewed it as a way for students to think and give evidence for their decisions. So in one way, it is an academic rationalist orientation, and in the other, a development of cognitive processes orientation (Eisner, 1979). The process side of doing a lab activity can require students to make inferences, speculations, and locating and solving problems (Eisner, 1979).

Third, the desire to make the curriculum user-friendly, in order to be used in a wide range of teaching contexts, was a factor that influenced the curriculum development process and final curriculum product. This included cutting down the amount of content, providing more teaching resources within the document, and streamlining the topics. It is evident in the data that the committee wanted the chemistry course to not be overloaded with content, but have less content and work towards a deeper understanding of it. This falls under the essentialist foundation (Ornstein & Hunkins, 2009)/academic rationalist orientation (Eisner, 1979) parameter because it is still purely content the students are learning, just less of it. The document analysis revealed that the committee did achieve this as there are fewer outcomes than in the 1998 transitional document. Another goal was to provide many resources that reflected specifically what teachers were currently doing in their classrooms. The 2013 curriculum does have many more resources that teachers can use, compared with previous Chemistry curricula in the province. Again, by document analysis, these supplementary materials have a heavy essentialist foundation (Ornstein & Hunkins, 2009)/academic rationalist orientation (Eisner, 1979) emphasis to them.

### **6.3.5 The microscopic/particulate level of understanding.**

This was another factor that influenced the curriculum, as evidenced by both the document analysis and analysis of participant interviews. This influence falls under the psychological foundation to curriculum (Ornstein & Hunkins, 2009). This is a specific learning theory which falls under the cognitive psychology aspect of the psychological foundation (Ornstein & Hunkins, 2009). The microscopic/particulate dimension of understanding is a way in which students can “generate structures of knowledge and how they create and/or learn reasoning and problem-solving strategies” (Ornstein & Hunkins, 2009, p. 118) in chemistry. The Johnstone (1993) model was the influence for this psychological foundation. This factor that

influenced the 2013 document is learning theory that guides not only how teachers should teach the chemistry content, but how students should be thinking about it.

The document analysis of the curriculum revealed no reference to the Johnstone (1993) model as a theory to guide the teaching and learning of chemistry. Instead it is incorporated into the section titled “The Modes of Representation” (Provincial Education, 2013, Section 2 p. 18). One participant said that the “The Modes of Representation” (Provincial Education, 2013, Section 2 p. 18) was drawn from previous science curricula in the province. This is another historical foundation (Ornstein & Hunkins, 2009) that influenced this curriculum. Therefore in this regard, the document itself is a combination of the relatively new psychological foundation (Ornstein & Hunkins, 2009) of the Johnstone (1993) model, with a historical foundation (Ornstein & Hunkins, 2009) evidenced in previous science curricula in the province.

#### **6.3.6 Political influences and lack of resources.**

The politics involved in the curriculum design and development was also a factor that influenced the 2013 document. The political influences are, arguably, a social foundation (Ornstein & Hunkins, 2009) to curriculum, in that the government had the most control over the curriculum development process. This supports the intense political nature of curriculum (Pinar et al., 1995). It was the Province that decided when and how the new curriculum should be developed. If the government did see the completion as a priority, then it would have been completed in a reasonable time-frame, as one participant shared in an interview. Ultimately it was the social forces of culture and government that influenced this curriculum document’s creation and completion.

Another issue that ties into the political influences was the lack of resources available. This only presented itself in the participant interviews, because the text of the document would not typically reveal this kind of information. On the other hand, there was a clue given in the

document showing that there seemed to be a change-over in leadership of the Grade 12 Chemistry curriculum process, which may be a reason for the stall at the government level. The political flex exercised on curriculum processes will only go as far as financial and person-based resources can stretch. One participant mentioned that a maximum of three people at the government level are responsible for all science curricula in the province. This is a social foundation dictated by the political party in power at the time. Second, another participant mentioned that because of the province's lower population compared to other provinces, the resources available for it is scarce. Because of this, the social foundation of being tied to another province's resources influenced the curriculum.

### **6.3.7 The curriculum development model.**

Another factor that influenced the 2013 document was the model used to guide the development process itself. The province has followed one model for the development of a number of curricula for various subject areas over a number of years. There is no research critiquing the model used in the province. The curriculum development team is comprised of a "departmental project leader/specialist, a qualified writer(s), and exemplary classroom teachers and scholars" (Provincial Education, 2014, Development Teams section, para. 3). The model also calls for input from "industry representatives, and other community members with relevant expertise" (Provincial Education, 2014, Curriculum Development Process section, para. 2). These people are not listed as specific members to make up the development team though. Henderson and Gornik (2007) suggest a curriculum committee be arranged from a broad range of representatives: "teachers, parents, community members, central office colleagues, students,...and university colleagues (2007, p. 97). They assert that, "We must remember that the members of this committee are equal...These relationships are collaborative" (Henderson &

Gornik, 2007, p. 97). In the case study of this research, the development team was mostly teachers and had little, if any, representation from other stakeholders. The team had heard from an outside stakeholder and had decided to set his/her propositions aside. The power given to the teachers to make decisions about what other stakeholder ideas to include was an influence that affected the curriculum overall.

### **6.3.8 Variety of development team member perspectives.**

As evidenced by all eight participants and in the document analysis, there were many perspectives within the development team. That is, there were a variety of foundations and orientations to curriculum. All four of the foundations were represented in the data: philosophical, historical, psychological, and social (Ornstein & Hunkins, 2009). The orientations represented in the data include the development of cognitive processes, personal relevance, social reconstruction, and academic rationalism (Eisner, 1979). This supports Pinar et al.'s (1995) view that curriculum is "autobiographical" (p. 847). Each stakeholder perspective is represented through a collection of autobiographies.

One participant revealed an awareness of the potentially over-emphasized essentialist foundation (Ornstein & Hunkins, 2009)/academic rationalist orientation (Eisner, 1979) point of view, as typically found in previous Chemistry curricula in the province and around the world. Even though the comment did not reveal what should be represented, it revealed awareness as to what Chemistry curricula has traditionally been.

Another participant described an experience trying to create an inquiry/investigative unit to be included in the curriculum. It is interesting that the committee wanted to develop a unit that would have probably had a development of cognitive processes orientation (Eisner, 1979) to it. They wanted to develop an entire unit that would have the students using and doing chemistry in

order to achieve not only the development of cognitive processes orientation, but, in addition, potentially many other orientations (Eisner, 1979). The team could not find a way that satisfied this desire, so they ended up changing the title to “Reactions in Aqueous Solutions” (Provincial Education, 2013, Section 4 p. 13) which reverted back to an essentialist foundation (Ornstein & Hunkins, 2009)/academic rationalist orientation (Eisner, 1979) stance (as support by the document analysis of the curriculum). That is, the specific learning outcomes and the associated content with each ended up being a string of content-heavy, mechanistic items.

#### ***6.3.8.1 Individual stakeholder power.***

Why were the stakeholders as a group not able to escape the grip of essentialism (Ornstein & Hunkins, 2009)/academic rationalism (Eisner, 1979) in the time that the *Pan-Canadian Protocol* and, potentially, other psychological orientations were obviously present within the development team? One participant discussed a possible answer to this question by presenting three points. The first point was that the teachers (who made up the entire development team) and the science consultant have full power to make decisions. They could potentially operate in an isolated environment and develop the curriculum without any outside influences. That is, the curriculum product could be an ‘autobiography.’ This is endorsed by his/her thinking that teachers were mostly concerned with the students they were currently teaching and how they individually were prepared for the next year. Third, s/he commented that one person, because of their particular role, because of the particular status that person held (whether it was because of a dominant personality, someone with many years of experience, etc.), was able to lessen the influence of a group of people who collectively shared the same view.

There is data presented and analyzed in Chapter Four that clearly indicates there is theoretical disconnect between the first half and second half of the 2013 document. Why does the second half of the curriculum show a major essentialist foundation (Ornstein & Hunkins, 2009)/academic rationalist orientation (Eisner, 1979) to curriculum?

### **6.3.9 Absence of clear overall vision.**

The last factor that influenced the design and development of the *Provincial Grade 12 Chemistry Curriculum Framework* (2013) curriculum document was the absence of a clearly articulated information base that the curriculum development team was expected to follow in the development process. Although there were parameters outlined for the team, there is no evidence there were any clearly defined theoretical foundations (Ornstein & Hunkins, 2009) and orientations (Eisner, 1979) to be used in informing the development process. Because of this the participants likely drew from their own experiences of what chemistry education should be like and what it should achieve for its participating students. Each participant's contribution to the written curriculum was their own story about what Chemistry curriculum should be. This supports Pinar's (1995) quote of curriculum being "intensely...autobiographical" (p. 847). There is a strongly held view that chemistry education is typically a content heavy, algorithmic, mathematical, getting-ready-for-university type course. This commonly supported academic orientation may be the reason why the development team was largely unaware of developing any further overarching philosophies or vision for the overall curriculum. To substantiate this idea, it was revealed that the team wrote the specific learning outcomes (which deals with content), primarily influenced by what had been emphasised in the transitional (1998) curriculum and what they believed was necessary for preparation for university, then fit in the "Cluster Zero: Skills and Attitudes" (Provincial Education, 2013, Section 4 p. 10) outcomes and general learning outcomes around those afterwards. Connected with this is that outside of historical and

academic rationalist thinking, the development team did not develop any further potential influences for informing the curriculum.

The above listed factors were identified in both the document analysis of the curriculum (factors evidenced in the text) and the descriptions of the process by the stakeholders involved. Whether the factors that originated from the stakeholders actually came out in the text of curriculum document is another question. The answer to research question one again emphasizes the nature of the “marble cake” (Bell, Carr, & Jones, 1995, p. 99) curriculum, distinct flavours being maintained in the final product.

The analysis of data revealed that when exploring research question one, by document analysis and interview data, the curriculum development team did agree on specific things that fall under one category when examined through the lenses of curriculum foundations (Ornstein & Hunkins, 2009) and orientations (Eisner, 1979). Namely, these were the emphasis on content, preparing students for university, the desire to mandate more labs, and to make the document more user-friendly. On face value, one may perceive that these factors represent a variety of foundations/orientations, but on deeper analysis of these factors, it is revealed that they are still heavily bound by an essentialist philosophical foundation (Ornstein & Hunkins, 2009)/academic rationalist orientation (Eisner, 1979). The other factors that influenced the 2013 document were the *Pan-Canadian Protocol*, the *Provincial Grade 12 Chemistry Transitional Curriculum Framework* (1998), the influence of the microscopic/particulate level of understanding, political influences, the lack of resources available, the curriculum development model used, the variety of perspectives involved in the process, and the absence of a clear overall vision for what the curriculum should accomplish.

The answer to the next research question helps to understand the reasoning behind many of the factors described in the above section.

#### **6.4 Discussion of results to answer research question (2)**

(2) What were the lived experiences of the stakeholders involved in the construction process from conceptualization through to implementation?

The lived experiences shared by the participants revealed a range of stories, coupled with a range of emotions. This confirms the notion that curriculum is “phenomenological” (Pinar et al. 1995, p. 847). Furthermore, not only is curriculum “phenomenological” (Pinar et al. 1995, p. 847), but the curriculum construction process is also phenomenological. Each stakeholder experienced the same phenomenon, the Chemistry curriculum development process. The research data indicates that each stakeholder experienced the process in varying ways. The descriptions of the stakeholder lived experiences helps to explain where they were positioned as individuals and as a team throughout the curriculum construction process. The data analysis showed “common meaning for several individuals of their lived experiences of a...phenomenon...[and] reduce[d] individual experiences...to a description of the universal essence” (Creswell, 2013, p. 76). The “common meaning[s]” (Creswell, 2013, p. 76) that describe the “universal essence” (Creswell, 2013, p. 76) of the phenomenon were: the feeling there was some reluctance to other points of view, some stakeholders felt undervalued during the development process, the presence of some stakeholder control, the treatment of some outside stakeholders, and making the pedagogy a part of the language of an specific learning outcome. There were two experiences that had a significant effect on some stakeholders. One was the presentation, and eventual inclusion of the unit Atomic Structure, and the other, an overall team

cohesiveness when working on the project. Lastly, there were a range of other unique experiences shared which was a theme within itself.

A first “common meaning” (Creswell, 2013, p. 76) presented was the feeling of reluctance to accept or acknowledge other viewpoints among other stakeholders. Some participants had rigid notions about how chemistry education should be defined. In turn, the development team as a whole was hesitant to give up the content-based orientation they initially held. One participant saw this as something that should not have happened, because it made stakeholders less open to other points of view. The chemistry group was quite inflexible in their beliefs of what the curriculum should look like.

Secondly, some stakeholders felt undervalued during the process, which led to feelings of tension, judgment, and competition. For example, if an idea was proffered, but deemed unconventional by others, the respect and credibility for the person presenting said idea decreased. This contributed to instances where individuals shut down or withdrew from their responsibilities due to feelings of animosity and inferiority between stakeholders. It is also important to note that these feelings of tension and rivalry was not restricted to the development team, comprised solely of teachers, but also extended to outside stakeholders. Due to the teachers’ view of their status in society coupled with their limited content knowledge (compared to experts in the field), a certain level of discomfort was experienced by some. The development team struggled to relinquish the prominence of the teacher’s role, where all authority and decision-making power is held by a teacher in his/her efforts to manage a classroom of students. While this opposition towards others may have been limited to several individuals, it hindered the work of the group as a whole. This also shows how potentially damaging taking part in a

curriculum development process can be to the people involved. Some participants felt deflated and underappreciated.

The imbalance of control between stakeholders was another theme of experience revealed through the data. There were certain instances where some stakeholders held authority over others. At one point, an anonymous process was suggested to help equalize the role of all stakeholders. For example, to avoid a single, but dominating voice from dictating the ideas and opinions of the entire group, anonymous voting for certain ideas was suggested. Another example of inequality among stakeholders was their teaching experience. More experienced teachers tended to have more control around the meeting table. Specific topic knowledge was also a way in which individual stakeholder control was gained. That is, certain people with expertise in certain topics were seen as the authority of how that specific topic should be addressed in the curriculum. The viewpoints and ideas of others were deemed less valid and worthy.

Further contributing to an imbalance of power, was the designation of specific roles. For example, the role of the writer held substantial power. The writer's job was to compile all the work of the stakeholders. Such work is subject to interpretation and bias. The written document did not go back to the development team for assessment. In the same regard, the writer handed it off to the editor, who further exposed the paper to subjective analysis. When finished with the editor, it did not come back to the writer for assessment. The curriculum process was like an extended game of 'telephone,' where the message got distorted more and more as the information was passed from person to person. It resulted in a disconnection of the creators from the creation.

There were experiences from outside stakeholders that furthered tension within the curriculum construction process. There was resistance when an academic presented his/her ideas to the development team. One participant mentioned that it seemed like a prescriptive presentation. S/he described the presentation as being treated like “secretaries” (Participant, personal communication, March, 2014). That is, the presenter came in and told them how it should be done, and that they should go off and “just do it” (Participant, personal communication, March, 2014). Another view was that because many teachers held the opinion of the education program at universities as failing at preparing teachers for the classroom, why should the views of an academic involved in providing that training be taken seriously? The atmosphere created in the room via body language and intentional silences on the part of the development team created tension when working with other stakeholders. This reaction was so prominent that the academic was not present at many of the team meetings.

Another tension that emerged from these lived experiences was including actual pedagogy within the wording of outcomes. One participant wanted to explicitly establish how teachers should be teaching chemistry in the outcomes themselves. Tension arose from a differing of opinions as to where the pedagogy should be included: in general learning outcomes or in specific outcomes or in the foundation explanations in the first half of the document. The pedagogy ended up being explained in the first half of the document, though minimal references are present through some specific learning outcomes as well. This was a controversial decision within the group because some participants believed that many teachers tend to skip over the first half of the document and go straight to the specific learning outcomes. Their concern was if the pedagogy is not clear in the specific learning outcomes, it will have little chance to permeate chemistry teaching in the province. The counter argument was that the specific learning

outcomes should not be so prescriptive, but rather allow some room for flexibility in how a teacher chooses to teach.

One event that emerged as a significant experience for some participants was a presentation made about Atomic Structure. The presentation stated that students needed a foundation in this topic for university preparation. Because many teachers in the province were already adding this unit to the curriculum (to prepare students for university), the unit was officially included. Although adding this unit was a minority suggestion, the development team agreed to add this entirely new unit to the document.

Another experience that sparked tension for some participants was the process of trying to work in an inquiry approach to chemistry. The team, as whole, aimed to emphasize the nature and process of science. However, they were unable to reach a satisfying resolution for the unit, which continues to be a unit that is content-focussed and gives a streamlined, overarching view that connects many different foci of chemistry together. It gives an overview of how different chemical concepts work together to make up an entire chemical system, but it does not emphasize the inquiry approach that the team had desired.

Another experience that reflected the lack of a clear philosophical foundation was the presentation by university professors where they were telling the teachers their ideas about how chemistry teaching should be done. The teachers listened to this, but were not forced to flesh things out for themselves before they started. Because of this, the process embarked on its own direction influenced by the personal orientations represented in the room day by day. That is, a direction potentially reflective of many chemistry curricula around the world—ones that are heavily content-focussed, once again falling short of the group's desire for an inquiry approach.

While tensions were present throughout the development process, it is important to note that some experiences were favorable. Many participants talked about how well the development team worked together. No issues ever got personal, and discussions were, for the most part, professional and respectful. One participant saw the varying personalities as an asset to the cohesiveness of the group.

There were a range of experiences, both positive and negative, outlined by the participants. In order to understand these experiences, it is helpful to read each participant's account under the identified themes.

The above section analyzed and discussed the lived experiences of the stakeholders during the curriculum construction process into common threads. These threads mostly fall under an umbrella of experiences that revealed some degree of tension. They are significant experiences that help explain some of the questions brought up in answering research question one. Furthermore, some of the experiences help explain why and how some of the factors from research question one influenced the curriculum. These descriptions focussed on the participant reports in the moment of the curriculum process.

### **6.5 Discussion of results to answer research question (3)**

In retrospect, how do the stakeholders look back at the process and the product?

The participants were asked to reflect on both the curriculum construction process and curriculum document product. There were many different thoughts and feelings. Again this proves that curriculum is “intensely...phenomenological” (Pinar et al. 1995, p. 847). There are ten themes which characterize how they looked back on the curriculum process and curriculum product. The first two themes were seen as missed opportunities. They were the inclusion of chemistry learning theory and the inclusion of a variety of stakeholders. Another theme from the

data was the view that the 2013 curriculum is not that significantly different than the 1998 transitional document. A fourth theme under this research question was the absence of a clear overall vision for the curriculum. In addition to this, there were feelings of disappointment due to the length of publishing time, and questioning what kind of impact the document has today. Looking back on the curriculum product, some stakeholders mentioned that the 2013 curriculum improved upon the previous curriculum. Furthermore, serving on the curriculum development team was seen as valuable professional development. The document allows for the further professionalization of teachers. Lastly, looking back on the work they had done, the stakeholders also offered a variety of recommendations and improvements.

A first missed opportunity from the participant interview data was that the learning theory specific to chemistry could have been emphasized more throughout the document. There is some evidence of the Johnstone (1993) model in the first half of the curriculum document, although different language is used and the model is not adequately represented. There is also some evidence in the second half of the document pertaining to the Johnstone (1993) model, although references to the particle level is quite limited in the specific learning outcomes and its associated material. Participants looked back and saw this as a missed opportunity to develop something unique in the realm of chemistry education, not only in the province, but potentially world-wide. On the other hand, one participant mentioned that s/he was not sure if the province's teachers would be willing to accept such a drastic change in what they were currently doing.

A second missed opportunity for the 2013 curriculum was the inclusion of a variety of types of stakeholders during the curriculum design and development process. Basically the development team consisted of teachers. Because of this, this teacher perspective dominated the process. Including other stakeholders, such as principals, students, parents, visible minorities,

Aboriginal perspectives, and experts in the field was seen as a missed opportunity for this particular curriculum document.

A third viewpoint of how stakeholders reflected back on their experiences of the process of developing the curriculum and the actual product, was that half the participants felt that the 2013 curriculum is not much different than the 1998 transitional curriculum. At the time of development, there was a feeling that they were making something different, but the final product did not seem to reflect these changes. The 1998 curriculum was a document made to transition teachers into the new 2013 curriculum under the framework of the *Pan-Canadian Protocol*. Because of this, it was used as a starting point for 2013 curriculum. Different ideas were presented that would separate the 2013 from the 1998 document, but the development team did not come to a place where they felt satisfied enough to make a significant change. As a result, there were many cosmetic changes, and some other minor modifications, but as a whole, participants felt the final product did not stray enough from the original 1998 curriculum. For many participants, this was a disappointing realization.

The absence of a clear overall vision for the curriculum was noted frequently among stakeholders when reflecting on their experience. This also came up as a recurring theme that led to answer research questions one and two as well. This makes it a significant point of reference for this study as a whole. Essentially the big picture goals were ultimately defined by the *Pan-Canadian Protocol*. In the document analysis, these goals were made clear in the document, as many statements were taken verbatim from *Pan-Canadian Framework of Science Learning Outcomes K-12 (1993)* document. However, the participant interview data revealed that these goals were not fully explored with and explained to the development team. The team did not go through these or use them as an overarching vision for what they were to do. Instead the team

blindly made decisions, not focussed on or united by any over-arching goal, but led by their own internal goals. It should also be noted that these personal and varying goal and motifs were never fully revealed to the group as a whole, or even defined on an individual level throughout the process, further contributing to a sense of disarray within the group and evident in the final curriculum document. Without any clear direction or end-point, the team did not really know what they set out to do in the first place. This approach answers the question as to why there is such an obvious disconnect between the first half and second half of the document, as outlined in the discussion of the first research question.

Also contributing to the second research question was the disappointment participants felt when looking at the nine-year time-span of the document's publication. This helps to answer a common question in the province's education. That is, why does the curriculum always seem to be out of date? This is especially true now in a world that experiences unprecedented levels of development and growth, especially in terms of technological advancements. Many participants could not help but wonder: If all of this work was put into a curriculum, only to be released nine years later, what was the point in the first place? The stakeholders were developing a curriculum that needed to respond to what they were noticing in classrooms, at that time. One has to wonder whether the issues they dealt with back then are still of significance now.

In addition to the feelings of disappointment, the impact of document was also questioned by participants. Along with the actual development of how curriculum is developed in the province, participants also questioned how curricula are then presented to the public, once complete. This particular 2013 document was released as one large document. It is mandated by the Province that teachers implement this in their classrooms, but ultimately the document stops at the classroom door. It is up to the teacher whether the written/formal curriculum will permeate

their classroom or not. There are no standards exams or outside accountability methods put in place that keep track of curriculum enactment throughout the province's classrooms. In a classroom, the curriculum ultimately becomes an 'autobiography' of the teacher in charge. Participants noted that perhaps there should have been more than just a simple book release and that more detailed instructions of implementation may have been of benefit.

While the publication of the document was met with disappointment by many, two participants discerned that the curriculum was still an improvement from the previous one. Of note was the inclusion of the "Modes of Representation" (Provincial Education, 2013, Section 2 p. 18) and the Johnstone (1993) model. That is, the learning theory included in the document suggests how students should think psychologically about chemistry, and in turn how teachers should teach chemical concepts. This was never done before in the provincial Chemistry curricula, and is among the first in the world. The analysis revealed that there is evidence of this learning theory in the document, though its presence is very minimal. A teacher implementing the new document could easily overlook this.

Another theme that reveals how stakeholders looked back on the process and product of the 2013 curriculum was that some saw it as a great growing experience for themselves as professionals. One participant noted that being involved in the process had a much more significant impact on the stakeholders than for anyone receiving the document. This raises the question: What if all chemistry teachers were involved in the process? Is it possible that all chemistry teachers could feel a sense of ownership in curriculum development, to the point that they consider themselves stakeholders working towards change? Would this empower and strengthen not only the province's curriculum, but also its teachers? It is these questions that push for an improved process for curriculum construction in the province. Do teachers need

more of a structured time to meet with other teachers to focus on their own practice? Is this enough, or do they need to feel like they are actual stakeholders in the process to produce change?

Along with the process providing valuable professional development for the stakeholders involved, participants pointed out the room for flexibility in the curriculum allowing for a teacher's own context. The specific learning outcomes are not pedagogically prescriptive, leaving room for teachers' interpretations. This allows the curriculum to support the professionalization of teachers within the province. That is, teachers are free to make decisions that are in the best interests for their students. The question then becomes, are teachers, specifically the province's chemistry teachers, prepared and versed enough in the pedagogy specific to chemistry to make those decisions? If the curriculum provides this flexibility, can chemistry teachers effectively consume the research on chemistry pedagogy and make it a part of their practice? Furthermore, if they do have these skills, will they actually implement it in their classroom? Will these ideas become a part of their 'teacher-being'?

Lastly, the participants had many recommendations and improvements. One suggestion was using more research-based ideas to form the goals of the curriculum. The goals of the 2013 curriculum were not really made clear to stakeholders. The things that the team did agree on were merely teachers' opinions of what should change. For instance, one influence was the teacher view to prepare students for university. Was this based on research that reported that the province's chemistry students were not prepared for the content they would encounter in university? Furthermore, what exactly do the teachers know about what students encounter in university? One would assume it is quite different at different universities. Are there common concepts that students really need to know to be prepared? What about being a critical thinker

and understanding science as a process? Were those taken into consideration when defining what it meant to prepare students for university? Another suggestion was that the leader of the development team be someone who really understands the curriculum development process, not just the content or pedagogical side of the subject. This person should be well-versed in curriculum theory. This person should have a wide understanding of different foundations and orientations to curriculum, and make sure that there is an appropriate balance represented. The writer of the curriculum document should also be an active part of the development committee. One participant talked about a certain “spirit” (Participant, personal communication, March, 2014) that developed over the course of the meetings and united the group, despite their differences. This is an aspect of humanity that could not have been prescribed. The only authentic way to capture this unity and commonality of the stakeholders in the pages of the document is to allow the writer to be privy to the actual development. The group also seemed to fail in their desire to emphasize the particle level. One reason was the lack of resources available that addressed chemistry at the particle level. As chemistry education advances, and there are more resources available that address the particle level, it would be of benefit to have these resources added to the document. Also suggested was the need to have a development team work on a project all at once, rather than sporadically throughout the school year as well as the simultaneous development of the different levels of chemistry, Grade 11 and Grade 12. If done together, the two could be pushed together as a unit in itself—a complete high school chemistry experience. It was also suggested to make the curriculum a living document where resources can be added as they become available. One way to do this is having the curriculum online. Under each outcome can be a section where stakeholders upload resources that address each outcome. The resources can be sorted so that ones that address the particle level are highlighted or put in a

separate category. Other suggestions included marketing and assessing the curriculum better. The curriculum was presented in a way where it gave teachers a variety of activities they could implement in their classroom. It did not present the overall goal of what the stakeholders wanted those activities to achieve. Furthermore, the curriculum was released and not really assessed. This should be a crucial step in curriculum development to see what works and what does not. Lastly, a participant questioned the need for a high school chemistry curriculum to continue to be content-focussed, developed predominantly for the vanishingly small number of students that go on to post-secondary studies in chemistry. Perhaps new orientations for chemistry education in the province should be seriously considered for the next curriculum. That is, the curriculum can be tailored to a broader-based student which fosters a positive appreciation and application of the subject in ways that are not just focussed on advanced study. A curriculum can really constrict itself if it is limited by one or few foundations and orientations. A better balance of these can be a way to open up curricula to appeal to more types of students.

Gathered from participant data, there were ten evident themes that answered the third research question. This question asked how the stakeholders looked back on the curriculum process and product that they were a part of. These ten themes represent a range of opinions, thoughts, and feelings. First, these included two aspects seen as missed opportunities, namely the inclusion of chemistry learning theory and a variety of types of stakeholders. Furthermore, there was a view that the 2013 was not really different from the 1998 curriculum, the realization that there was an absence of a clear over-arching vision for the curriculum, feelings of disappointment generated by the document taking so long to publish, and questioning as to the actual impact of the document on chemistry education in the province. There was also the view that the newer 2013 curriculum still made significant inroads compared to the previous

curriculum, the view that the curriculum construction process served as good professional development, and that the document still has room for teachers to make professional decisions for their own teaching contexts. Lastly, based on participant experiences and insight and the researcher's thoughts from the study, recommendations and suggestions for curriculum design and development were discussed.

#### **6.6 Discussion of results to answer research question (4)**

(4) What is the nature of any deconstruction and/or reconstruction processes the stakeholders experienced?

This process, if present at all, can be quite a personal, individual experience. Again, this supports Pinar et al.'s (1995) claim that curriculum is "phenomenological" (p. 847). Along with this, this research shows that the curriculum development process can be transformative as well. Surprisingly, there were characteristics that emerged that were common among participants who experienced, to some degree, a deconstruction/reconstruction process. Two main characteristics were identified from multiple participants: they need time for reflection and to work together regularly. Lastly, there was one individual stakeholder case that provided descriptive data to help understand a process of deconstruction/reconstruction that s/he experienced.

Stakeholders needed time for reflection. Each participant noted that the first thing they did was enter a time of deep self-reflection. They started asking questions about why they taught certain things the way that they did. From this, they entered a period of considering other options that might suit their context better than what they have been doing. One participant added the realization that there are many factors that put pressures on the curriculum construction process. The idea of making a shift in one's own thinking about how one teaches, not only started with

time to reflect, but also the will to think about it intentionally. With these two aspects in place, one can enter in to a time of professional evolution.

The second theme that participants described was the need to meet regularly. They stated that a one day seminar on chemistry education was not effective in creating a true shift in their views of chemistry education. They must be together, focussing on particulars about their practice, not only what they think about it themselves, but also how students respond to it. The participants indicated that it was important to talk about the way they did specific lessons, not just talk in generalities. One participant compared this point of reconstruction to family relations. In an ideal family situation, one feels safe, accepted, and comfortable with being vulnerable to new behaviours. The curriculum development process can be the map to foster these feelings. Once achieved, people can feel safe to open up, and perhaps rework some previous notions. New ideas can be formed in this inclusive environment.

As noted, there was an individual participant case where s/he roughly identified his/her process of deconstruction/reconstruction into four stages. It is worth presenting this case here as a springboard to further research into the mechanism in which the process can occur. The first stage was that s/he entered a time of outlining his/her own personal philosophy, along with outlining the pedagogy that would follow that philosophy. Once this was completed, s/he explained that these ideas were then put into practice. That is, s/he took the ideas identified that framed the way s/he was teaching and then tried to match that with the activities in the classroom itself. Next, s/he came to a place of dissatisfaction. Throughout the implementation of the initially defined philosophy and pedagogy, the participant was able to identify inconsistencies with what was actually occurring and how it lined up with what s/he thought of as his/her philosophy and pedagogy. This then caused more questions to be asked of him/herself. The

initial philosophy and pedagogy was then redefined over and over again until the dissatisfaction began to fade. Lastly there was a realization that different people are at different places in their professional growth at different times. With this realization, certain philosophies and pedagogies were formed due to the place where the teacher defines themselves, at that time. Only after growth and self-reflection can this produce a transformation of views.

It is concerning that one of few times teachers seem to experience a shift in philosophical and pedagogical thinking is by being involved in a curriculum development process. This means that, with the busy schedules that teachers endure, they have very little time to meet regularly with other colleagues and discuss specific aspects of their practice. This helps explain how teachers can essentially become stuck in their ways. If they do not have time to meet with others and deeply reflect on their practice, no change can occur. This research questions the process as to how to encourage teachers to accept and adopt new ways of thinking in terms of curriculum. Perhaps releasing a document is not enough for true change to occur. This study's research suggests that regular, structured time must be arranged, with an exposure to other points of view, in order to foster a process of professional growth involving new ideas.

The above was a discussion of two characteristics as to the nature of individual deconstruction/reconstruction processes via many participants. That is, these two characteristics emerged from multiple participants. The last section of the discussion of data for this research question investigated a single participant's process of deconstruction/reconstruction. S/he was able to provide insightful data which helped to identify stages of the way in which it unfolded for him/her. These four stages can be, and should be, investigated and explored further in their contribution to the curriculum development process.

**6.7 Why is there disconnect between the orientation of the first half (introduction section) and the second half (specific learning outcomes and associated content) of the 2013 document?**

From the analysis of data, this minor research question arose. Although it was not explicitly stated as an initial research question, there is evidence in the first half of the document of the Johnstone (1993) model. The Johnstone (1993) model is revealed in the first half through the use of different language, namely the “Modes of Representation” (Provincial Education, 2013, Section 2 p. 18). However, this model remains absent in the second half of the document. One participant explained this, suggesting that the Johnstone (1993) model may have been out of the comfort zone of the teachers at that time. The team assumed that teachers naturally think about chemistry at the particle level. The team did not intentionally think about it as a guiding principle in the curriculum development. Furthermore, another participant revealed the reason for the supplementary activities having an essentialist foundation (Ornstein & Hunkins, 2009)/academic rationalist orientation (Eisner, 1979). The reason was because the resources they were drawing from did not reflect the particulate level. Textbook and online resources were quite scarce at the time of addressing the particle level.

Another participant contributed the obvious disconnect to different people having responsibility for different parts of the document. S/he explained that the first pages were written by one person. That person was likely not in conversation with the entire development team. The specific learning outcomes were written by individual teachers, and the resources attached were written by another contributor, without any contact or discussion made between these two parties. Each one of those parts ended up being each person’s “autobiography” (Pinar et al. 1995, p. 847) manifest in the pages of the curriculum resulting in multiple biographies evidenced in the

curriculum text. Alongside this, there was likely no operational mechanism that was able to bring all of these perspectives under a common thread.

### **6.8 Section Summary**

The above sections analyzed and discussed data through document analysis and interview data. Research question one was answered by combining and analyzing interview data with the document analysis data. The main factors that influenced the 2013 curriculum were identified. The remaining research questions were answered by the interview data. Common themes emerged for each research questions. Some mini-cases within the context of the large case came forth which provided more insight in order to achieve a better understanding the overarching case. Lastly, a minor research question that came from the data analysis was presented and discussed.

### **6.9 Implications of this Research**

One implication of this study goes back to the realization of the intensely complex nature of curriculum construction. Revealing the story behind this particular curriculum can help equip teachers with the necessary information they need to make decisions in their own classroom contexts. This rings true with what Connelly and Clandinin (1988) say. They comment that, “It is important that we [teachers] know and understand the various stakeholders and their stakes...so we can be appropriately responsive” (p. 124). By revealing the intentions and realities that play out in the curriculum construction process, this gives teachers who actually use the document a sense as to the time and place of the stakeholders involved. This helps teachers make informed decisions about their practice.

Another implication is it will bring forth the story behind a specific curriculum in the province. It reveals the influences involved in its design and development. This is important for

guiding future curriculum developments, not only within the province, but beyond. Due to the qualitative nature of this study, it is not concluded that these factors occur in other curriculum development settings, or even exist at all. It outlines specific influences and perspectives within one single case, bounded by one time frame, in one place, among a specific group of people. On the other hand, readers can make decisions and applications by comparing what was found in this research to their own personal contexts.

A third implication of this research is directed towards future chemistry specific curriculum. The study outlines aspects such as missed opportunities and presents suggestions for the next Chemistry curriculum to be developed. This is significant in that this research influences the next curriculum development team by informing them about their job: to determine what students should be learning in school and the best means for teachers to present this information.

In the researcher's understanding, this is the only research available within the case study's province that explores the human interrelations embodied within curriculum development, especially as embodied in curriculum as text. The thesis analyzed the model for curriculum process in the province, and the myriad of events, feelings, tensions, and influences that contributed to the eventual completion of the official curriculum document. The implication here is that this research can inform future curriculum developers as to some of things that occurred within the province's chemistry context.

Lastly, the major theme that emerged when exploring three out of the four research questions was the need for a clear philosophical vision before diving into the curriculum construction process. This was missed in this particular case study, which caused the process to continue unguided. A last implication of this research is that stakeholders need to characterize the big picture pathway of the curriculum being developed. The question needs to be asked:

What should the curriculum achieve? What should the overall informing philosophy be? This implication actually shows itself in an experience that one participant vividly remembers. It warns, but also gives hope and inspiration to educators who have experienced or who are experiencing the tensions involved in teaching within their own contexts. The participant who recalls the experience was in the audience at a science conference for a presentation about different visions for curriculum. The participant mentions that a person commented (who was also involved in the same 2013 Chemistry curriculum development) that s/he wishes s/he would have known the information presented at the conference before engaging in the development of the Chemistry curriculum. The following is not presented as data that answers the research questions, but rather as a way to demonstrate an implication of the research of this thesis:

The presenter was saying we should maybe question if we are including some of these different visions in the curriculum...To have one vision is quite debilitating and is not sufficient for students who are in the public system...[We need to] make sure we have an openness so the teacher can orient the curriculum in his way...[A person then stood up and said he wished he would have known this before and said] ‘Now the curriculum is done, so now what?’...The presenter said... ‘every teacher is going to follow the curriculum of his soul...Teachers are intelligent human beings and...every teacher is probably going to teach what fits him and his students. When we are developing a curriculum, have that in mind when we’re starting, when we’re working on it, and when we’re done we have to take a look back and say ‘Did we achieve the orientation that we wanted to achieve?’’...That flabbergasted the [person] who asked the question because [s/he] was in this cognitive conflict saying ‘Oh my gosh, I don’t think we did that’ (Participant, personal communication, 2014).

The main implication of this study remains a simple one: it is important to understand how we determine what students should learn in school. Bringing to the forefront influences, experiences, reflections, and processes, a more informed way to develop curricula can be achieved.

### **6.10 Chapter Summary**

This chapter gave a general overview of the entire study, re-stated the research questions, answered the research questions, provided further insight and discussion pertaining to the research questions, and discussed the implications of the results. This chapter was the most general interpretation of the study, highlighting the most over-arching aspects. It is helpful to note that the true essence of these overall results and conclusions can only be fully understood by journeying through the actual accounts revealed by the stakeholders themselves, as provided in Chapter Five. In Chapter Seven that follows, overall conclusions are made from this investigation and opportunities for further research is presented.

## **Chapter Seven: Conclusions and Opportunities for Further Research**

### **7.1 Introduction**

This concluding chapter presents the findings drawn from the data collection, analysis, and discussion, working alongside the pertaining literature. It concludes a variety of ideas that has to do with the humanity of the design and development of Chemistry curriculum. Section 7.1 presents the conclusions, and Section 7.2 brings up opportunities for further research as an extension of this project.

This study illustrates the human interplay associated with curriculum design and development. The final curriculum document is a physical book with only certain aspects revealed in its pages. Underneath, within the very core of those pages, are many influences, personalities, and tensions. Individual beliefs and interactions become evident in the pages of written curriculum document. This thesis explores the very essence of this humanity that comes to be displayed within the pages of the *Provincial Grade 12 Chemistry Curriculum Framework* (2013) written curriculum document.

### **7.2 Conclusions**

It is concluded that both the curriculum construction process and the actual curriculum document were painted with swirls of colour, taste and smell that give evidence of the influences, ideologies, personalities, backgrounds, and perspectives that are represented by the individuals associated with the process. Pinar et al. (1995) suggested curriculum is “intensely historical, political, racial, gendered, phenomenological, autobiographical, aesthetic, theological, and international” (p. 847). In the case of the *Provincial Grade 12 Chemistry Curriculum Framework* (2013) curriculum, this research revealed, especially, the “historical, political,...phenomenological, [and] autobiographical” realms. This research did not show that

curriculum is “racial, gendered, . . . aesthetic, theological, and international” (Pinar et al. 1995, p. 847). Just because this research did not reveal these realms, it does not mean they do not exist. At the same time, Pinar et al. (1995) made a generalization about all curricula. This research does not generalize all curricula, but rather reports what was found with a specific case. This research revealed other descriptions of curriculum that Pinar et al. (1995) do not mention. That is, curriculum is quite personal, social, psychological, philosophical, and transformative. The social, psychological, and philosophical entities were revealed in answering research question one. Research question four revealed that the curriculum construction process can be quite transformative as well.

This study revealed the human dynamics that played out in the design and development of a single Chemistry curriculum in a Canadian province, the *Provincial Grade 12 Chemistry Curriculum Framework* (2013) written/formal document. It determined the main factors that influenced the document, the lived experiences of the stakeholders’ involvement, and how the stakeholders looked back on the process and product. These three elements, as reflected in the first three research questions, were answered with multiple data sources and analyses. Furthermore, a different, but interesting conclusion arose from the last research question, which looked at the nature of any deconstruction/reconstruction processes that the stakeholders experienced. There are two characteristics identified that help describe the nature of the deconstruction/ reconstruction processes, which were drawn from multiple participant perspectives. Lastly, a rich description of one particular participant (an individual case within the larger case) was outlined to determine stages of one particular deconstruction/reconstruction process. It is concluded that due to the richness of the description, this was a pretty complete deconstruction/reconstruction process. That is, the participant arrived at a true point of change

where s/he actually had to set aside his/her previous notions of chemistry to make room for new ones. This experience was then confirmed by an outside observer, in an event that occurred outside the realm of the actual curriculum development process (presented near the end of Chapter Six).

It was the social relationships and interactions, especially in dialogue, that influenced the curriculum construction process and the curriculum document itself. Due to this social nature of curriculum, this research confirms Ornstein and Hunkins (2009) comment that curriculum is indeed a dynamic field. The *Provincial Grade 12 Chemistry Curriculum Framework* (2013) written/formal document is indeed a “marble cake” (Bell, Carr, & Jones, 1995, p. 99) due to the human involvement. It is true that the stakeholders are “buffeted by strong educational, social, and political forces affecting the curricular decisions they must make” (Olivia, 1997, p. 482). According to Goodlad (1979), the ideal curriculum rarely influences the written curriculum. Goodlad (1979) explains that the stakeholders make decisions primarily on their knowledge of the subject, their teaching experiences, and their perceptions of their students. In turn, stakeholders who are teachers, as most were in this study, made their decisions by drawing from their own knowledge, experiences, and views. The teachers did not focus on the ideal curriculum desired by experts in the field. For the 2013 Chemistry curriculum, there were few experts who actually had a chance to state their ideal curriculum. Even if more stakeholders were given the chance, the development team, the writer, and then the government representative had full veto power on those ideas. Sowell (2005) reminds us that, “developers...must arrive at decisions after careful thought, because living with the consequences of decisions made by default or haste is difficult (p. v). In the case of this study, decisions were not made hastily and were given careful

thought. It is questioned whether the development team had enough tools to frame this “careful thought” (Sowell, 2005, p. v) though.

Another question is whether “living with the consequences of decisions” is difficult or not for teachers implementing the curriculum. One piece missing from the development of this curriculum is the assessment of the curriculum. Officially, there has not been one done yet, so this question remains unanswered. The assessment and evaluation of the 2013 curriculum is now left up to each individual teacher to decide.

Belth (as cited in Connelly & Clandinin, 1988) states that, “Curriculum is considered to be the increasingly wide range of possible modes of thinking about men’s experiences” (p. 5). In terms of the conclusions drawn from this thesis’s research, this is true. The ways in which curriculum can be viewed has expanded as a result. First, one way to look at curriculum is through the realization that it contains intensely intimate human interactions. Stakeholders in the curriculum construction process came to different conclusions about the experiences they had because they are different people with different backgrounds. In this way, the 2013 curriculum ended up being quite “autobiographical” (Pinar et al. 1995, p. 847) and biased. One has to wonder who each stakeholder was representing when sitting around the meeting table. Whether intending to or not, they represented the situations they were currently in and the students they were currently teaching. As a result, they wrote their own stories about not only what their students should know in chemistry, but what all students in the province should know about chemistry. Along with the curriculum being “autobiographical” (Pinar et al. 1995, p. 847), this research concludes that was also quite “phenomenological” (Pinar et al. 1995, p. 847). That is, the lived experiences of the stakeholders essentially dictated what they thought about the curriculum development process and the curriculum document product. Furthermore, these lived

experiences also determined what they chose to represent in the curriculum pages as well. The stakeholders in the curriculum construction process were determined as learners as well, with “different backgrounds, motivations, and levels of aspirations” (Godlad & Su, as cited in Sowell, 2005, p. 6). It is concluded that indeed the stakeholders brought purpose for what students should learn in chemistry, but did not bring purpose for their own learning through the curriculum construction process. What the stakeholders learned, just sort of happened, and in many cases could not be explained. It is their “currere” (Pinar & Reynolds, 1992, p. 32) that determined their learning.

In terms of the last research question, the nature of deconstruction/reconstruction processes, Tanner and Tanner’s (1995) definition of curriculum as the “reconstruction of knowledge and experience that enables the learner to grow in exercising intelligent control of subsequent knowledge and experience” (p. 189) also rings true from this research. In terms of the stakeholders themselves as learners while designing and developing curriculum, some of them rebuilt and reorganized their notions of chemistry education in such a way that they achieved a new level of understanding. It now gives them the power to deal with future situations in a more informed way.

Sowell (2005) also explains that curriculum change can only occur “after individuals have made internal transitions” (Sowell, 2005, p. v). Sowell (2005) admits that these “transitions take time, understanding, and support on the part of all people involved” (p. v). From this research, there were few participants who showed signs of these internal transitions, and for the few that did, these transitions took years to experience, let alone to realize. One has to wonder then if in fact the new curriculum had much impact, not only on teachers implementing it, but for the stakeholders themselves.

Unruh and Unruh (1984) outline a challenge when constructing curricula. They say that is difficult to reach consensus on “basic theoretical assumptions” (Unruh & Unruh, 1984, p. 63). Marsh and Willis (1995) suggest that these assumptions are not easily agreed upon because they say that, “Different positions cannot be understood until they have been clearly enunciated, explored, and subjected to criticisms. Then and only then can informed consensus be reached” (Marsh & Willis, 1995, p. 138). In the context of the 2013 Chemistry curriculum, the different positions were not adequately “enunciated, explored, or subjected to criticisms” (Marsh & Willis, 1995, p. 138). This research revealed two important aspects in this regard. One is that the participants viewed the team as working very well together where conflict or opposing views were seldom present. Second, the reason for this is some stakeholders felt shut down by others and eventually would not share their views anymore, but rather go along with the status quo of the group. Marsh and Willis (1995) explain that the exploration and criticisms of different points of view is quite beneficial to change in curriculum ideas. The data revealed that the 2013 document is much the same as the 1998 document. The reasoning for this was partly due to what Marsh and Willis (1995) are talking about. The steps to change were not realized by the development team, so they indeed ended up with a curriculum much the same as the previous one. What is learned from this is that other points of view should be intentionally explored when developing new curricula. If the goal of the development is to create something new and create change, different viewpoints must first be “enunciated, explored, and subjected to criticisms” (Marsh & Willis, 1995, p. 138).

There were some stakeholders who had already “bunker[ed] in” (Participant, personal communication, March, 2014). These stakeholders were quite reluctant to change their views of chemistry education. This confirmed Pinar’s (2011) assertion that, “What holds us back are

resistances whose origin is to be sought in the archaic layers of our personal history” (p. 36). As a result, was a churning out of a curriculum that was much the same as the last. Pinar (2011) describes it as, “a compulsive repetition of the same concepts...with which it inaugurated itself...as ‘new’” (p. 36). This is what happened with the 2013 Chemistry curriculum. Another idea given by Connelly and Clandinin (1998) helps stakeholders develop a curriculum that is an improvement from the past. They suggest that stakeholders first articulate reasons why they do what they do, and why they are what they are. The team did do this as the development process went on, but did not engage in this at the beginning. Narratives were scattered throughout the process but were absent from the get-go, failing to provide a framework and understanding from the onset.

Another conclusion from this research is that the decisions made by the development team were based on the philosophies they held both as a collective and as individuals. These philosophies served as the framework to follow which guided the decision-making. Van Til (as cited in Ornstein & Hunkins, 2009) points out that, “Without philosophy, [we make] mindless vaults into the saddle...[We] ride madly off in all directions” (p. 31). It is interesting that indeed the development of the 2013 curriculum did have, initially, a philosophy as provided in the *Pan-Canadian Protocol*. It was outlined by the person who wrote the first half (introduction) of the curriculum document. The problem was that these philosophies were not really considered by the development team when creating the second half (specific learning outcomes and associated content) of the document. In turn, the development team did not define a clear philosophy that would guide them in their work. In a sense it is likely there was a game plan, but no apparent articulation of that plan, or, at least, it was ignored and silenced as autobiographies began to be written. It is interesting to conclude that yes, different ideas came up, but the curriculum did not

ride “madly off in all directions” (Van Til, as cited in Ornstein & Hunkins, 2009, p. 31). Instead, the foundation and orientation that took over and became the emphasis was, conservatively, the essentialist foundation (Ornstein & Hunkins, 2009), and the academic rationalist (Eisner, 1979) orientation. Ornstein and Hunkins (2009) suggest that the overarching philosophy be defined at the beginning and then revisited over and over as the development process goes on. They suggest that the philosophy can be amended as needed. In terms of the case study of this thesis, this did not happen. There was no clear philosophy set at the beginning, and the team did not revisit or re-establish any over-arching philosophy as they progressed. For the development team of the 2013 Chemistry curriculum, the “philosophy was ‘on the back burner’” (Doll, 1986, p. 182). The philosophy was overlooked at first and really only entered the equation after the fact, if really at all. Two of the biggest names in the curriculum field, Tyler and Dewey, whose ideas in many ways underpin the entire 2013 curriculum, suggest that it is very important to pinpoint the educational philosophy before designing the rest of the curriculum. In another regard, Wiles and Bondi (1984) explain that without an educational philosophy “school programs meander, become targets for social pressure, or operate in a state of programmatic contradiction” (p. 89). In a way, the construction of the 2013 curriculum became both a target for “social pressure” (Wiles & Bondi, 1984, p. 89) and is somewhat “contradictory” (Wiles & Bondi, 1984, p. 89). Because of no clear overall philosophy, the development team ended up orienting with a heavy content focus. The commonly evidenced socially constructed view of chemistry teaching as task orientation and that a chemistry teacher’s job is to teach chemistry content and prepare students for university, took over in this case study. This “social pressure” (Wiles & Bondi, 1984, p. 89) of what a chemistry teacher should be doing ended up influencing the curriculum in a big way. Second, the curriculum document within itself ended up being somewhat “contradictory” (Wiles

& Bondi, 1984, p. 89) in that the first half (introduction) and second half (specific learning outcomes and associated content) of the document emphasize different foundations and orientations. This disconnect was outlined and discussed in Chapter Six. Again, in order to avoid these downfalls, stakeholders needed to develop an over-arching philosophy. Wiles and Bondi (1984) suggest that stakeholders “solidify their professional values” (p. 43), then put into words the overarching philosophy as evidence of clarity (Olivia, 1997). This process may have helped the development team clarify the over-arching vision in the case of the 2013 Chemistry curriculum construction process. In addition to clarifying the individual stakeholder philosophies, as a group the philosophy could have been strengthened even further. Doll suggests that, “As [(stakeholders)] discuss curriculum philosophies, group members tend to become helpfully critical of their original purposes” (Doll, 1986, p. 31). They could have then come up with an “eclectic approach to philosophy, choosing the best from several philosophies” (Olivia, 1997, p. 190). That is, putting all the individual philosophies on the table could have set the team up to pick the best ones out of the ones defined initially by the stakeholders. If the team engaged in this process, perhaps an over-arching vision could have resulted. As a suggestion for improvement, Olivia (1997) warns against some challenges faced when engaging in philosophy creation. One is that there has to be a consensus among stakeholders of the agreed upon over-arching philosophy, otherwise it is “useless” (Olivia, 1997, p. 192). Second, she warns against leaving philosophy statements too vague. In that case, too many interpretations present themselves, and as a result the frame the philosophy is trying to build crumbles (Olivia, 1997).

Along with providing a clear overall philosophy, it is also concluded that this particular curriculum development fell into one of the traps that Sowell (2005) describes. The development team members took more of a reactive rather than proactive approach to creation of the 2013

curriculum largely in response to inadequacies of current practice the participant teachers were experiencing. One example in which the development team reacted was in terms of mandating more lab activities. The focus seemed to be pinpointing the things that the previous curriculum failed to express. There were, though, a few proactive ideas that were expressed in the curriculum construction. One idea was the inclusion of the particulate dimension (Johnstone, 1993), but this was not emphasized in the document itself. Sowell (2005) explains that a reactive approach to curriculum development often ends up creating a curriculum that closely mirrors its predecessor. In the case of the 2013 curriculum, many participants thought that this document closely mirrored the 1998 curriculum, making the curriculum process a perpetuation of history, unable to interrupt this consideration.

It has been concluded that many things could have been done differently to improve the 2013 curriculum construction process. This study also concludes that curriculum construction is infinitely complex and that there is “no single pattern...[that] will suffice in solving all curriculum problems” (Sowell, 2005, p. 25). The fact that many different human backgrounds, personalities, and contexts are involved, make it even more complex. Indeed stakeholders had to “reconcile differing values, and manage several variables at once” (Sowell, 2005, p. 133). The development team in this case study managed to do this with a great deal of cooperation and respect for each other.

Doll (1986) discusses many trends that have been present over curriculum development's relatively short lifespan (compared with other disciplines). It appears that the 2013 Chemistry curriculum construction process reflected many of these trends. The first trend is that the idea that educating *all* children is also supported in discussions about curriculum development; that is. Chemistry is an opportunity for all, not just a select few doing further science study. One

participant noted this as one thing s/he deemed important in the development of the 2013 curriculum, but an inclusive approach was largely ignored. In contrast, the emphasis of the document was that students pursue further chemistry study in university. In this regard, this curriculum does indeed have many students filtered by this chemistry-for-a-few mentality. Second, the trend that educational ideas that have solid research are “adopted very slowly by practitioners” (Doll, 1986, p. 21) is true in the 2013 curriculum development as well. The researched learning theory of teaching and learning chemistry proposed by Johnstone (1993) was something that was ignored by the development team at first. It ended up making its way into the final document, but again in a minimal way. A third trend Doll (1986) explains in that teachers are expected to develop curriculum over and above their regular duties as a classroom teacher. This was reflected in almost all stakeholder cases in the 2013 curriculum process. A last trend is tending towards the further professionalization of teachers, rather than the course being textbook driven. This research concludes that the 2013 curriculum did in fact leave room for professional decisions to be made by the classroom teacher. The curriculum is not textbook driven, and is open enough that teachers can approach the content in a way that is best for their students.

According to Doll (1986), social influences permeate curriculum in a large way. Doll discusses the human nature involved in curriculum construction. He states that, “Many teachers cannot prove that their curricula and methods of teaching are actually functioning for improved learning, but they will resist strenuously any effort to bring about change... numerous traditions exist today without justification or validity” (Doll, 1986, p. 88-89). In the case of the 2013 curriculum, the more experienced stakeholders did things the way they did because it anecdotally worked within their own classroom contexts. This thesis’s research concludes that certain stakeholders held more influence and directed the curriculum process and outcome. This was due

to aspects such as dominant personalities, their role in the process, and prior experience. These stakeholders did not have to prove that their methods improved learning outcomes in their own classrooms. Their view of what was important influenced strongly both process and outcome. As might be expected, these were the stakeholders that typically were more resistant to other points of view.

The process of the 2013 curriculum construction was admittedly, according to some participants, “backwards” (Participant, personal communication, March, 2014). The development team defined the specific learning outcomes and then fit in the general learning outcomes around those. This reflects what Grummet (1992) describes as a problematic issue in curriculum development. Grummet (1992) states that, “Those charged to design curriculum flee from ambiguity to mechanistic and analytic descriptions of the process of education” (Grumet, 1992, p. 31). Human nature is extremely complex and often cannot be expressed as a series of linear steps. It is clear why curriculum designers may fall back to this approach: it is easier and more straight-forward. It seems that the development team did fall back on defining chemistry education in the province as mechanistic steps to reach a certain end. The analysis of the specific learning outcomes revealed a linear and mechanistic approach.

A question brought up by the participants was, who are we representing? In the case of the 2013 curriculum, the stakeholders “differences in vision...depend upon the paradigm in which [they were] situated” (Henderson & Gornik, 2007, p. 96). They represented two main things: their own values and views and their students’ values and views. They represented the status quo. The stakeholders ‘autobiographically’ defined their own teaching contexts, and represented them as such around the development team table. There were no other outside influences on the curriculum allowed to disrupt this consideration. Henderson and Gornik (2007)

suggest that there be a broad range of representation: “teachers, parents, community members, central office colleagues, students, . . . and university colleagues (2007, p. 97). They assert that, “We must remember that the members of this committee are equal . . . These relationships are collaborative” (Henderson & Gornik, 2007, p. 97). It is concluded that this did not happen, other than from what was developed as informed by the *Pan-Canadian Protocol* in the initial segment of the 2013 Chemistry curriculum.

Henderson and Gornik (2007) also talk about the importance of deliberation. They say that, “It is through deliberating that we make informed and wise curriculum judgements, as opposed to decisions by default based on habits or custom” (Henderson & Gornik, 2007, p. 99). The data did not reveal any significant instances of deliberation in this particular curriculum development process. That is, there was no indication from participants that their thinking was disrupted by anything said or experienced during the curriculum process. There was no fundamental reconsideration of other orientations to underpin the curriculum. This may help to explain again why the new curriculum maintained uniformity with the transitional curriculum and emphasizes the history of chemistry education as a content-dominant, largely de-contextualized, algorithmic and mechanistic learning area. That is, the essentialist philosophical foundation (Ornstein & Hunkins, 2009)/academic rationalist orientation (Eisner, 1979) to curriculum.

Marsh and Willis (1996) comment that many curriculum development projects are “dominated by specialists and experts” (p. 138). In the case of the 2013 Chemistry curricula, this was not really true, although this had been the case in past provincial Chemistry curricula. In the past, the provincial Chemistry curricula were heavily influenced by chemistry experts within academia. The 2013 curricula was just the opposite. It was purely teacher driven. Paris (as cited

in Marsh & Willis, 1996) would have loved the way the 2013 curriculum was developed. Paris (as cited in Marsh & Willis, 1996) claims that only classroom teachers should be developing curriculum because of their experience directly with students. The problem revealed in this model, as concluded from this thesis's research, rings true with what Marsh and Willis (1996) say. They say this model can work if the teachers have “an understanding of the skills involved in [1] designing a curriculum...and [2] develop[ing] policy statements” (Marsh & Willis, 1996, p. 139). In the context of the development of the 2013 curriculum, this was not the case. There were only a few participants who were knowledgeable specifically in curriculum design and development, especially in terms of theoretical foundations of curriculum. One upside to this, as outlined by Marsh and Willis (1996), is that there were no third party groups that had a certain agenda to push through the curriculum. Other than personal agendas from the stakeholders (mostly teachers), there were no special interest groups that had an effect on the curriculum process or overall document. For instance, if industry experts were included around the table, they may have pushed for certain content in order to benefit their specific industry.

Lastly, and likely most importantly, Sowell (2005) explains that, “Curricular change occurs only after *individuals* have made internal transitions. That is, people must ‘end the old’ before they can ‘begin the new.’ Transitions take time, understanding, and support on the part of all of the people involved” (p. v). Sowell suggests that some sort of deconstruction process take place in order to shake up previous beliefs and emerge to a new level of understanding. In the case of the 2013 curriculum, there were few stakeholders who experienced this change. Perhaps this is another reason as to why the 2013 curriculum did not seem to have a major impact on chemistry education in the province. Most participants did not experience a process of deconstruction/reconstruction. Because of this, they could not come to a place of true change to

then affect the written/formal 2013 curriculum document. Overall, it is concluded that there is still a lot to research and learn about understanding the nature of these processes in terms of curriculum construction.

### **7.3 Opportunities for Further Research**

The results of this study bring up many questions that can be explored with further study. The first question extends from the results and analysis of research question four, concerning deconstruction/reconstruction processes. There are a few questions generated from this:

What, if any, are the specific identifiable stages of a deconstruction/reconstruction process in terms of curriculum development?

What characteristics are typically present when a stakeholder deconstructs a certain perspective they have?

What characteristics are typically present when a stakeholder reconstructs a certain perspective?

Second, within the context of this case study alone, there are many more research questions that can be investigated. For each of the influences revealed from research question (1), the main factors that influence each of those factors alone can be investigated. An example is

What are the political factors that influenced the extended official release of the curriculum document?

The overall methodology and even research questions posed in this thesis can serve as a model for a case study investigation for any curricula. The influences, lived experiences, retrospection of the process and product, and nature of any deconstruction/reconstruction processes for any curriculum can be explored. Different influences, lived experiences, would permeate because of the different dynamics involved in the different cases. This can contribute to further

understanding of curriculum construction dynamics in order to inform both creators and consumers of curriculum.

Next, this research defined stakeholders as the people involved in designing and developing curriculum. That is, the people studied here were the effectors of the curriculum. The other side to this is analyzing the people who are affected by the curriculum. A study of the teachers who implement this particular curriculum and the students who experience that implementation would help to further understand other types of human dynamics involved in the curriculum processes (Ornstein & Hunkins, 2009).

Finally, this research only looks at the design and development of the curriculum construction process. Further research can investigate both implementation and evaluation stages. This is an important realm of curriculum construction that needs attention even in a general provincial context, let alone in a chemistry specific context.

#### **7.4 Chapter Summary**

This chapter outlined overall conclusions to the study as a whole. Drawing from the literature and data collected, analyzed, and discussed in this study, conclusions were made about the complexity of the humanity involved in curriculum construction in regards to this particular case. The chapter made suggestions for further research that can be built upon not only the results and conclusions of this study, but even the structure of the methodology itself. It is a general study that can be applied to any curriculum construction context. A journey towards a better understanding of curriculum design and development is a journey that can only end with more informed decisions about what students should learn in school and what processes can lead to fostering such aspirations. This journey of understanding is hopefully one that will not be ignored, but continue on for educators not only provincially, but within the wider world

community. This study, hopefully, contributes to reconsidering how that journey is enacted provincially and in other jurisdictions internationally. Curriculum construction is a human process and it will display in its text the dominant humanity present at the table of deliberation.

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## Appendix A

**INTERVIEW QUESTIONS FOR PARTICIPANTS**

*This interview will take about 1.5 hours. Some or all of these questions may be a part of the interview. You may choose not to answer any question at any time without penalty. You may use these questions as a guide, responding to their open and/or detailed nature. I may prompt you with these questions as the interview progresses.*

1. If you wish, briefly describe your educational background and experience.
2. Can you describe your background with chemistry education? Teaching? Curriculum involvement? Expertise?
3. If you wish, describe your role in the curriculum construction process.
4. How did you get involved in the creation of the new chemistry curriculum?
5. Why did you get involved in the creation of the new chemistry curriculum?
6. Who decided that there should be a new chemistry curriculum?
7. Now think back to before you were involved in the curriculum construction process. Pretend I asked you these questions back then:
  - a) What are the most important things to you in chemistry education?
    - b) Why should students take chemistry?
    - c) What are the main things students should learn in chemistry?
    - d) How should students think about chemistry?
    - e) How should students think in chemistry?
    - f) What do you think students should do in chemistry?
    - g) What do you believe students should care about in chemistry?
8. What did you want the new curriculum to accomplish?
9. Did you want to bring these views to the table in your meetings/communications with other members?
10. Were you able to communicate these ideas with other people on the team? Do you think your ideas were taken seriously in the committee discussions?

11. Can you describe some of the differing views? Were they all acknowledged? Were they all listened to?
12. What were the common views among the committee members?
13. Who or how did the team decide what views would be adopted into the curriculum? What was the process for this?
14. Can you describe what types of differences between people on the team created problems, that is, if there were problems?
15. What were the main things that impacted the curriculum construction process?
16. Describe any events that pop out as significant in any way when you think back about the process?
17. Do you feel that anyone else involved had more or less power than you? How so?
18. Can you describe any tensions you experienced during the process?
19. What do you think caused these tensions?
20. Can you describe any problems with the process itself? Was the process fair/unfair in any way?
21. Can you describe how these problems were resolved, if at all?
22. Looking back on the process, how do you feel about it?
23. Can you describe any missed opportunities in the construction of the curriculum?
24. If you could do it again, what you do differently?
25. Can you describe whether you feel your ideas were represented in the final document?
26. What is your opinion of the new document?
27. Are you satisfied with how the document turned out? Was the arrival of the document as expected or not? If not, how so?
28. In your view, why was the curriculum so long in forthcoming?
29. How is the new curriculum different from the old?
30. What is your opinion about how the curriculum construction process turned out?
31. Did you have to deconstruct any previous notions about chemistry education? If so, how did you do this?

32. Can you describe any new ideas you had think about?

33. Can you describe how you have had to rethink your own views about chemistry education, if at all?

34. Describe how your views of chemistry education changed as a result of being involved in the curriculum process, if at all.

35. Is there anything else you would like to tell me? If so, please explain.

## Appendix B

**PARTICIPANT RECRUITMENT E-MAIL (on U of M letterhead)**

**Project title:** Curriculum Construction as Curriculum: Influences, Lived Experiences, and Deconstruction/Reconstruction Processes

**Researcher:** Joel Kulik

**Advisor:** Dr. Brian Lewthwaite (he will not have access to audio-recordings or transcripts)

**Institution:** University of Manitoba

I, Joel Kulik, a University of Manitoba Masters of Education student, am engaging in research that will examine the human dynamics involved in the construction of the *Provincial Grade 12 Chemistry Curriculum Framework* (2013) curriculum document. I am interested in gathering information about the factors that influenced the curriculum construction process, and the experiences and reflections of the stakeholders involved. The purpose of this project is to understand the human dynamics involved in curriculum construction.

I am looking for people who meet the following criterion:

- (a) Were involved in the process for any amount of time.
- (b) Willing to share their experiences and reflections about the process.

and should be willing to spend about one and half hours being interviewed (as well as other short follow up/clarification interviews), as well as checking with me to ensure that the interview data is accurate (about two additional hours).

I got your name from the “Acknowledgements” section of the *Provincial Grade 12 Chemistry Curriculum Framework* (2013) curriculum document. I searched your workplace website to get your contact information.

The interview will be audio-recorded and transcribed verbatim and will explore factors that influenced the construction of the *Provincial Grade 12 Chemistry Curriculum Framework* (2013) curriculum document. A copy of the interview transcript will be returned to you so that you can check the accuracy of my representation of what you have said which should take approximately 2 more hours of your time. The audio-recordings will then be destroyed. The written transcripts will be destroyed after this project is complete. Any files will be permanently deleted from the computer hard-drive. Any paper copies will be put through a confidential shredding and thrown out into the garbage in separated clumps. The data will be kept in a locked location separated from this consent form. The written transcripts will have no identifying information on them. There are no risks involved in this study. Benefits include the opportunity to receive feedback about the study results, understanding the influences of the construction of the curriculum, learning about other experiences and reflections on the process.

Because I am interviewing a group of people who are identified in the actual written

curriculum document (in the "Acknowledgments" section of the *Provincial Grade 12 Chemistry Curriculum Framework* (2013) curriculum document), there is the possibility that somebody reading the study would be able to identify the interviewees. There is also the possibility that participants would be able to identify other participants because they worked together on the curriculum construction committee together. Precautions will be taken by me, the researcher, to minimize this risk. I will use pseudonyms in data collection, data analysis, and results reporting. I will also remove any revealing information mentioned in the interviews by mistake, such as school name. Furthermore, I will transcribe the interviews and send them back to you to go over make any changes/additions/deletions as you see fit. I will delete the audio recordings and soon as transcriptions are complete (by me, the researcher). The transcriptions will be destroyed once the thesis is complete. I cannot guarantee anonymity, although steps will be taken to maximize anonymity. I will present aggregated data to protect individual identities, although I cannot guarantee full anonymity.

Participation is totally voluntary.

The study has been approved by the Education/Nursing Research Ethics Board (ENREB). If you have any questions about this study, please feel free to contact Joel Kulik at [REDACTED], or by email at [REDACTED]. You may also call the Human Ethics Coordinator at [REDACTED].

If you may be willing to participate, please contact me by e-mail at [REDACTED] or by telephone at [REDACTED].

## Appendix C

**RESEARCH PARTICIPANT INFORMATION AND CONSENT FORM (on U of M  
letterhead)**

**Title of Study:** Curriculum Construction as Curriculum: Influences, Lived Experiences, and  
Deconstruction/Reconstruction Processes

**Principal Investigator:** Joel Kulik



**Advisor:** Dr. Brian Lewthwaite



**Institution:** University of Manitoba

You are being asked to participate in a research study. Please take your time to review this consent form and discuss any questions you may have with the study staff. You may take your time to make your decision about participating in this study and you may discuss it with your friends, family or (if applicable) your doctor before you make your decision. This consent form may contain words that you do not understand. Please ask the study staff to explain any words or information that you do not clearly understand.

Purpose of Study

This study is being conducted by a Masters student from the Faculty of Education at the University of Manitoba in Winnipeg, Canada, Joel Kulik, for thesis component of the program. The purpose of this project is to understand the human dynamics involved in curriculum construction. Participants were chosen based on their specific work on the *Provincial Grade 12 Chemistry Curriculum Framework* (2013) curriculum document. The information for participants was obtained from the names listed in the “Acknowledgements” section of the public curriculum document issued by the Province. All data, results, and analysis (including audio recordings and transcripts) will be kept in a separate location from contact information and consent forms. It will be kept in a locked office that only the researcher has access. This locked office is located in my home.

A total of 7-10 participants will participate in this study.

### Study procedures

Participation is voluntary. You are asked to consent to one interview, which should last about an hour and a half. The time and location of the interview will be determined by mutual convenience. The interview will be audio-recorded and transcribed verbatim and will explore factors that influenced the construction of the *Provincial Grade 12 Chemistry Curriculum Framework* (2013) curriculum document. A copy of the interview transcript will be returned to you so that you can check the accuracy of my representation of what you have said which should take approximately 2 more hours of your time. The transcriptions will be done by the researcher. The audio-recordings will then be destroyed by permanent erasure. The written transcripts will be destroyed by August 2014, after this project is complete. Any files will be permanently deleted from the computer hard-drive. Any paper copies will be put through a confidential shredding and thrown out into the garbage in separated clumps. The data will be kept in a locked location separated from this consent form. The written transcripts will have no identifying information on them.

Participation in the study will be until the thesis is complete which will be by the last day of August 2014. You can stop participating at any time. However, if you decide to stop participating in the study, we encourage you to talk to the researcher first. There are no consequences if you stop participating in the study, other than your perspective will not be shared. Aggregated data will be presented to protect individual identities.

Please understand that you are free to withdraw your consent and discontinue your participation in this study at any time without prejudice or consequence simply by telling me. Please be assured that your confidentiality will be maintained at all times. At no time will your name or any closely identifying information be included in any documents generated from this study. You may choose a pseudonym for yourself if you like. All interview information received from you will be stored digitally by pseudonym on a computer to which only the researcher involved in this study will have access. The informed consent sheet containing your name will not be kept with the interview data, and will be stored in a locked drawer in the researcher's office where only he has access to it, avoiding the possibility of connecting your name to any information that you have given. You have the opportunity to request a copy of the summary of the study's result.

### Risks and Discomforts

There is minimal risk in this study. The potential risk is that you may reveal information about the work of other people involved in the curriculum construction process. This may create some stress. Another risk is that anonymity cannot be guaranteed. Because the group of people working on this curriculum was small, and because of the role of certain people, some people reading the study may be able to identify participants. The thesis

advisor, Dr. Brian Lewthwaite will not have access to the audio recordings of transcripts. Because the researcher is interviewing a group of people who are identified in the actual written curriculum document (in the "Acknowledgments" section of the *Provincial Grade 12 Chemistry Curriculum Framework* (2013) curriculum document), there is the possibility that somebody reading the study would be able to identify the interviewees. There is also the possibility that participants would be able to identify other participants because they worked together on the curriculum construction committee together.

### Benefits

Benefits include the opportunity to receive feedback about the study results, understanding the influences of the construction of the curriculum, learning about other experiences and reflections on the process. You can receive a summary of findings once the study is complete.

### Costs

All the procedures, which will be performed as part of this study, are provided at no cost to you.

### Payment for participation

You will receive no payment or reimbursement for any expenses related to taking part in this study.

### Confidentiality

Information gathered in this research study may be published or presented in public forums, however your name and other identifying information will not be used or revealed. Despite efforts to keep your personal information confidential, absolute confidentiality cannot be guaranteed. Your personal information may be disclosed if required by law.

Precautions will be taken by the researcher to minimize this risk. Pseudonyms will be used in data collection, data analysis, and results reporting. Furthermore, any revealing information mentioned in the interviews by mistake, such as school name, will be removed. Aggregated data will be presented to protect individual identities. Furthermore, the researcher will transcribe the interviews and send them back to you to go over make any changes/additions/deletions as you see fit. Audio recordings will be deleted and soon as transcriptions are complete the researcher. The transcriptions will be destroyed once the thesis is complete. Anonymity cannot be guaranteed as there was a group of ten people that worked on this curriculum construction. Anonymity cannot be guaranteed, although steps will be taken to maximize anonymity. Aggregated data will be reported to protect individual identities, although full anonymity cannot be guaranteed.

All records will be kept in a locked secure area and only the researcher will have access

to these records. No information revealing any personal information such as your name, address or telephone number which will reside a locked office in the researcher's home. Only the researcher will have access to this room.

#### Voluntary Participation/Withdrawal from the Study

Your decision to take part in this study is voluntary. You may refuse to participate or you may withdraw from the study at any time. If the researcher feels that it is in your best interest to withdraw you from the study, he will remove you without your consent.

The researcher will tell you about any new information that may affect your health, welfare, or willingness to stay in this study.

#### Questions

You are free to ask any questions that you may have about your rights as a research participant. If any questions come up during or after the study, contact the study researcher: *Joel Kulik* at [REDACTED].

For questions about your rights as a research participant, you may contact the Human Ethics Coordinator at [REDACTED].

Do not sign this consent form unless you have had a chance to ask questions and have received satisfactory answers to all of your questions.

#### Dissemination Plan

This research will be submitted to be disseminated in the following ways. First, it will be disseminated as a Master's thesis publication. It is also intended to be contributed to the MERN (Manitoba Education Research Network) forum in science education, to the Canadian Journal of Educational Administration and Policy journal, and to the Chemistry Education Research and Practice journal. This research will be submitted after the thesis is published beginning in September 2014.

This research has been approved by the Education/Nursing Research Ethics Board. If you have any concerns or complaints about this project you may contact any of the above-named persons or the Human Ethics Coordinator at [REDACTED]. A copy of this consent form has been given to you to keep for your records and reference.

Statement of Consent

I have read this consent form. I have had the opportunity to discuss this research study with *Joel Kulik*. I have had my questions answered by them in language I understand. The risks and benefits have been explained to me. I believe that I have not been unduly influenced by the researcher to participate in the research study by any statements or implied statements. Any relationship (such as employer, supervisor or family member) I may have with the researcher has not affected my decision to participate. I understand that I will be given a copy of this consent form after signing it. I understand that my participation in this study is voluntary and that I may choose to withdraw at any time. I freely agree to participate in this research study.

I understand that information regarding my personal identity will be kept confidential, but that confidentiality is not guaranteed. I authorize the inspection of any of my records that relate to this study by The University of Manitoba Research Ethics Board, for quality assurance purposes.

By signing this consent form, I have not waived any of the legal rights that I have as a participant in a research study.

I agree to be contacted for future follow-up in relation to this study,

Yes \_ No \_

**Participant signature** \_\_\_\_\_ **Date** \_\_\_\_\_

(day/month/year)

**Participant printed name:** \_\_\_\_\_

I, the undersigned, attest that the information in the Participant Information and Consent Form was accurately explained to and apparently understood by the participant or the participant's legally acceptable representative and that consent to participate in this study was freely given by the participant or the participant's legally acceptable representative.

**Witness signature** \_\_\_\_\_ **Date** \_\_\_\_\_

(day/month/year)

**Witness printed name:** \_\_\_\_\_

**I would like to receive a summary report of the findings:**

        
**YES**

        
**NO**

**Please mail a summary report of the findings at:**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

I, the undersigned, have fully explained the relevant details of this research study to the participant named above and believe that the participant has understood and has knowingly given their consent.

Printed Name: \_\_\_\_\_ Date \_\_\_\_\_  
(day/month/year)

Signature: \_\_\_\_\_

Role in the study: \_\_\_\_\_

Relationship (if any) to study team members: \_\_\_\_\_

## Appendix D

**RECRUITMENT LETTER FOR SUPERVISOR/EMPLOYER (on U of M letterhead)**

**Title of Study:** Curriculum Construction as Curriculum: Influences, Lived Experiences, and Deconstruction/Reconstruction Processes

**Principal Investigator:** Joel Kulik



**Advisor:** Dr. Brian Lewthwaite



**Institution:** University of Manitoba

I, Joel Kulik, a University of Manitoba Masters of Education student, am engaging in research that will examine the human dynamics involved in the construction of *Provincial Grade 12 Chemistry Curriculum Framework* (2013) curriculum document. I am interested in gathering information about the factors that influenced the curriculum construction process, and the experiences and reflections of the stakeholders involved. The purpose of this project is to understand the human dynamics involved in curriculum construction.

I am looking for people who meet the following criterion:

- (a) Were involved in the process for any amount of time.
- (b) Willing to share their experiences and reflections about the process.

and should be willing to spend about one and half hours being interviewed (as well as other short follow up/clarification interviews), as well as checking with me to ensure that the interview data is accurate (about two additional hours).

I got the names of possible participants from the “Acknowledgements” section of the *Provincial Grade 12 Chemistry Curriculum Framework* (2013) curriculum document. I searched the workplace websites to get contact information. **You are either the supervisor or employer of a participant in this study.**

The interview will be audio-recorded and transcribed verbatim and will explore factors that influenced the construction of the *Provincial Grade 12 Chemistry Curriculum Framework* (2013) curriculum document. A copy of the interview transcript will be returned to the participant so that they can check the accuracy of my representation of what they have said which should take approximately 2 more hours of their time. The audio-recordings will then be destroyed. The written transcripts will be destroyed after this project is complete. Any files will be permanently deleted from the computer hard-drive. Any paper copies will be put through a confidential shredding and thrown out into the garbage in separated clumps. The data will be

kept in a locked location separated from this consent form. The written transcripts will have no identifying information on them. There are no risks involved in this study. Benefits include the opportunity to receive feedback about the study results, understanding the influences of the construction of the curriculum, learning about other experiences and reflections on the process.

Because I am interviewing a group of people who are identified in the actual written curriculum document (in the "Acknowledgments" section of the *Provincial Grade 12 Chemistry Curriculum Framework* (2013) curriculum document), there is the possibility that somebody reading the study would be able to identify the interviewees. There is also the possibility that participants would be able to identify other participants because they worked together on the curriculum construction committee together. Precautions will be taken by me, the researcher, to minimize this risk. I will use pseudonyms in data collection, data analysis, and results reporting. I will also remove any revealing information mentioned in the interviews by mistake, such as school name. Furthermore, I will transcribe the interviews and send them back to you to go over make any changes/additions/deletions as you see fit. I will delete the audio recordings and soon as transcriptions are complete (by me, the researcher). The transcriptions will be destroyed once the thesis is complete. I cannot guarantee anonymity, although steps will be taken to maximize anonymity. I will present aggregated data to protect individual identities, although I cannot guarantee full anonymity.

Participation is totally voluntary.

The study has been approved by the Education/Nursing Research Ethics Board (ENREB). If you have any questions about this study, please feel free to contact Joel Kulik at [REDACTED], or by email at [REDACTED]. You may also call the Human Ethics Coordinator at [REDACTED].

**If you are willing to grant permission for the participant to participate** (who was named in the "Acknowledgments" section of the *Provincial Grade 12 Chemistry Curriculum Framework* (2013) curriculum document who represents/represented your workplace), please sign this form.

Supervisor/Employer signature \_\_\_\_\_ Date \_\_\_\_\_

(day/month/year)

Supervisor/Employer printed name: \_\_\_\_\_

## Appendix E

**INFORMATION FOR POSSIBLE PARTICIPANTS (on U of M letterhead)**

**Project title:** Curriculum Construction as Curriculum: Influences, Lived Experiences, and Deconstruction/Reconstruction Processes

**Researcher:** Joel Kulik

**Advisor:** Dr. Brian Lewthwaite (he will not have access to audio-recordings or transcripts)

**Institution:** University of Manitoba

I, Joel Kulik, a University of Manitoba Masters of Education student, am engaging in research that will examine the human dynamics involved in the construction of the *Provincial Grade 12 Chemistry Curriculum Framework* (2013) curriculum document. I am interested in gathering information about the factors that influenced the curriculum construction process, and the experiences and reflections of the stakeholders involved. The purpose of this project is to understand the human dynamics involved in curriculum construction.

I am looking for people who meet the following criterion:

- (a) Were involved in the process for any amount of time.
- (b) Willing to share their experiences and reflections about the process.

and should be willing to spend about one and half hours being interviewed (as well as other short follow up/clarification interviews), as well as checking with me to ensure that the interview data is accurate (about two additional hours).

I got your name from the “Acknowledgements” section of the *Provincial Grade 12 Chemistry Curriculum Framework* (2013) curriculum document. I searched your workplace website to get your contact information.

The interview will be audio-recorded and transcribed verbatim and will explore factors that influenced the construction of the *Provincial Grade 12 Chemistry Curriculum Framework* (2013) curriculum document. A copy of the interview transcript will be returned to you so that you can check the accuracy of my representation of what you have said which should take approximately 2 more hours of your time. The audio-recordings will then be destroyed. The written transcripts will be destroyed after this project is complete. Any files will be permanently deleted from the computer hard-drive. Any paper copies will be put through a confidential shredding and thrown out into the garbage in separated clumps. The data will be kept in a locked location separated from this consent form. The written transcripts will have no identifying information on them. There are no risks involved in this study. Benefits include the opportunity to receive feedback about the study results, understanding the influences of the construction of the curriculum, learning about other experiences and reflections on the process.

Because I am interviewing a group of people who are identified in the actual written

curriculum document (in the "Acknowledgments" section of the *Provincial Grade 12 Chemistry Curriculum Framework* (2013) curriculum document), there is the possibility that somebody reading the study would be able to identify the interviewees. There is also the possibility that participants would be able to identify other participants because they worked together on the curriculum construction committee together. Precautions will be taken by me, the researcher, to minimize this risk. I will use pseudonyms in data collection, data analysis, and results reporting. I will also remove any revealing information mentioned in the interviews by mistake, such as school name. Furthermore, I will transcribe the interviews and send them back to you to go over make any changes/additions/deletions as you see fit. I will delete the audio recordings and soon as transcriptions are complete (by me, the researcher). The transcriptions will be destroyed once the thesis is complete. I cannot guarantee anonymity, although steps will be taken to maximize anonymity. I will present aggregated data to protect individual identities, although I cannot guarantee full anonymity.

Participation is totally voluntary.

The study has been approved by the Education/Nursing Research Ethics Board (ENREB). If you have any questions about this study, please feel free to contact Joel Kulik at [REDACTED], or by email at [REDACTED]. You may also call the Human Ethics Coordinator at [REDACTED].

If you may be willing to participate, please contact me by e-mail at [REDACTED] or by telephone at [REDACTED].

## Appendix F



**Research Ethics and Compliance**  
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## APPROVAL CERTIFICATE

March 6, 2014

**TO:** Joel Kulik (Advisor B. Lewthwaite)  
Principal Investigator

**FROM:** Lorna Martin, Acting Chair  
Education/Nursing Research Ethics Board (ENREB)

**Re:** Protocol #E2014:007  
"Curriculum construction as curriculum: Influences, lived experiences, and deconstruction/reconstruction processes"

Please be advised that your above-referenced protocol has received human ethics approval by the **Education/Nursing Research Ethics Board**, which is organized and operates according to the Tri-Council Policy Statement (2). **This approval is valid for one year only.**

Any significant changes of the protocol and/or informed consent form should be reported to the Human Ethics Secretariat in advance of implementation of such changes.

**Please note:**

- If you have funds pending human ethics approval, please mail/e-mail/fax (261-0325) a copy of this Approval (identifying the related UM Project Number) to the Research Grants Officer in ORS in order to initiate fund setup. (How to find your UM Project Number: <http://umanitoba.ca/research/ors/mrt-faq.html#pr0>)
- if you have received multi-year funding for this research, responsibility lies with you to apply for and obtain Renewal Approval at the expiry of the initial one-year approval; otherwise the account will be locked.

The Research Quality Management Office may request to review research documentation from this project to demonstrate compliance with this approved protocol and the University of Manitoba *Ethics of Research Involving Humans*.

**The Research Ethics Board requests a final report for your study (available at: [http://umanitoba.ca/research/orec/ethics/human\\_ethics\\_REB\\_forms\\_guidelines.html](http://umanitoba.ca/research/orec/ethics/human_ethics_REB_forms_guidelines.html)) in order to be in compliance with Tri-Council Guidelines.**