

**A Text Analysis of British Columbia's Redesigned
Mathematics Curriculum:
From Verbs to Voice to Values**

**by
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Abstract

During the ten years between 2009 and 2019, the British Columbia (BC) Ministry of Education envisioned, created, and mandated a redesigned curriculum for the province. There were significant structural changes in the curriculum – in particular, a move towards more competency-based standards than content-based ones – but this thesis will examine the way the document functions to frame mathematics, the learners, and the teachers in certain ways. Michael Halliday’s *Systemic Functional Linguistics* (SFL) is used to examine the mathematics component of this curriculum, with a particular focus on his metafunctions. The analysis also draws on Candia Morgan and Beth Herbel-Eisenmann’s work, who both use Halliday’s metafunctions to analyse the language in different mathematics texts; and on teacher interviews that I conducted. In this analysis, I aim to find out how the choices made in the writing of the document—verb tense, use of pronouns, forms of address—function to produce meanings about teaching, learning and mathematics. Three aspects of the redesigned curriculum are highlighted: a) its author(s) and possible intended audiences – I investigate how the author presents themselves, how they address their audience, and the relationship between the author and audience, b) assumptions made about the nature of the teacher and child presented in the text, often indirectly, and c) characteristics of the text itself, including its clarity.

Keywords: mathematics curriculum; redesigned curriculum; clarity; personalised learning, 21st-century learning; Ministry of Education

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Chapter 1. Introduction

1.1. Motivation

In my role as a teacher and mathematics mentor teacher, I work with the redesigned British Columbia (BC) mathematics curriculum on an almost daily basis, and this has allowed me to become quite familiar with the document. Part of my employment involves supporting teachers in implementing this curriculum, both through professional development opportunities and through mentorship. This requires me to understand the curriculum both within and across grades, which means I tend to study it often and carefully. Through this looking carefully, many questions have arisen for me, and it is these questions that formed the motivation for this dissertation. I listed a few of them in a December, 2020 excerpt from my Ph.D. journal:

1. In every grade, under the content section, it says, “Students are expected to know the following...”. This has bothered me since I read and wrote about Anne Watson’s book,¹ as I do not know what is meant by “students are expected to know” – know for how long? In what way? Just for a test? And more importantly, *who’s* know? What it means to know something might be different in western versus Indigenous worldviews².
2. I am not sure if the elaborations³ are just examples or what. They are unclear at times and certainly do not include everything. Maybe some preliminary statements need to be made around what the intention is around those.
3. Indigenous content is always separate and last in the content elaborations⁴.
4. What is the connection between the mathematics curriculum and numeracy?

¹ I was first introduced to Anne Watson’s 2006 book, *Raising Achievement in Secondary Mathematics*, from one of my professors in the program. The doctoral students and faculty later read it together for a book club.

² The curriculum includes a substantial amount of Indigenising language, and this is one of the significant (and more difficult) changes in the redesign.

³ The elaborations are suggestions or clarifying notes, and are provided in list format after selected learning standards (outcomes) in the curriculum.

⁴ When an elaboration about a mathematics content standard contains suggestions regarding how to connect to First Peoples worldviews or perspectives, this elaboration is always last on the list.

Regarding the last question, the Ministry (2022a) highlights a renewed focus on literacy and numeracy in the redesign, but the connection between numeracy and the standards in the mathematics curriculum is not made explicit.

I also had a question that I think many teachers have regarding the learning standards, which is *what if not?* The standards seem so fixed – “Students are expected to know the following” (Province of British Columbia, 2022d, e) – but what if “the following” is too difficult for some or for many students? Then what? There is no acknowledgement in the curriculum of the diversity that exists among mathematics learners within a single grade. Most classes consist of students who are at (sometimes very) different stages in their mathematical development. How shall a teacher proceed for example, in a grade 5 class, if half the class has mathematical proficiency only up to the grade 2 or 3 level? The Ministry of Education (hereafter just called the Ministry) has assumed the existence of a homogeneous class, where all students are ready for grade level content. I realize that writing a curriculum that addresses this diversity would be extremely difficult, but I found myself increasingly surprised that the Ministry had not at least acknowledged it or offered some suggestions for teachers.

There is also the issue of a lack of clarity in many of the learning standards. I worked with a Grade 6 teacher recently who was asking me about teaching multiplication and division of decimals. The learning standard says, “multiplication and division of decimals” but does not say whether this means multiplication and division of decimals by decimals, or of decimals by whole numbers. The elaborations do not provide clarification – they only list one example of each, both of which show multiplication/division of a decimal by a whole number. Then, in the curriculum for Grade 7, the standard says “operations with decimals” but does not provide details on what that should look like. So, it is not clear whether students are ever expected to learn to multiply or divide decimals by decimals.

I appreciate that many teachers wanted a more flexible curriculum, and that this lack of clarity was perhaps intended to offer this flexibility, but not all teachers interpret it this way. I think that, for many, the unclear or vague expectations are a source of frustration. I wonder if instead, providing *more* clarity, and a note to teachers regarding how they can work flexibly with the standards, would be more helpful.

It is not my intent here to say that the redesigned mathematics curriculum is not a good one. I have colleagues who love this curriculum – in fact, some of my colleagues wrote much of it! Rather, it is to say that there is another discourse happening among teachers. Many teachers I work with want more guidance, and support – both to understand and to implement the curriculum. They appreciate the flexibility, and that the curriculum is less prescriptive than it has been in the past, but would like more specificity regarding what is actually expected of them. One of my colleagues, who is also a helping teacher, shared with me that teachers in her district who may not understand the curriculum and how it is intended to be used, often fall back on teaching mathematics the way they learned in school, or using unvetted resources. She argues that elementary school teachers often do not have the time to invest in learning mathematics and the mathematics curriculum on a deep enough level to be able to support students within such a flexible model. She noted that regular and structured inservice would have been very helpful. On the other hand, another of my colleagues who was on the curriculum development team sees this as the teacher's responsibility. He explained that the curriculum is intentionally vague as a way of being more inclusive – if learning standards are not well-defined, it is more difficult for a student to not meet the standard. He said there is no place in a curriculum policy document for teacher supports, and that teachers are responsible for learning the mathematics they are required to teach. So our teachers are divided to some degree, where many find this curriculum to be fine as is and a step forward, while others may agree with this to some degree, but find it unhelpful the way it is currently written. I am in this latter group. I would like to acknowledge here as well that the nature of my job means that I am entering into this work with some of my own opinions and ideas about the redesigned curriculum. Because of this, I have tried to lean heavily on the frameworks and theory I am presenting so as to keep my own thoughts or opinions at bay.

To orient the reader, the next section is a description of the redesigned curriculum – the rationale and timeline for creating it, some of the changes, and its structure. Following that is the story of how I came to know about the extensive work of Michael Halliday and text analysis, how this became my chosen direction for working with this curriculum, and finally, I provide an overview of the structure of this thesis.

1.2. The Redesigned BC Mathematics Curriculum

Over the past 13 years, the BC Ministry of Education has planned, developed, and mandated a redesigned curriculum. The rationale for this redesign is offered in the Curriculum Overview. The author(s) (2022a) claim that although “British Columbia has one of the best education systems in the world”, it must transform to keep up with a rapidly changing world:

Yet it is an education system modelled on the very different circumstances of an earlier century — when change was much more gradual than it is today. Conditions in the world are changing greatly and rapidly. Today’s students will grow into a world that is very different from and more connected than that of generations before.

To maintain high achievement, British Columbia must transform its education system to one that better engages students in their own learning and fosters the skills and competencies students will need to succeed. One focus for this transformation is a curriculum that enables and supports increasingly personalized learning, through quality teaching and learning, flexibility and choice, and high standards.

What follows is the timeline of the development and implementation of this curriculum and some of the changes highlighted by the Ministry. The inclusion of the timeline is important as it may help to explain some of what is revealed from the analysis that follows.

1.2.1. Timeline

For this, I draw from three sources: a British Columbia Teachers’ Federation (BCTF) research report (Gacoin, 2018), Vicheth Sen’s (2016) critique of BC’s provincial education plan, and BC’s provincial education plan (Province of British Columbia, n.d.).

The timeline is as follows:

2009

- International Congress for School Effectiveness and Improvement (ICSEI) meets in Vancouver where Valarie Hannon (founding member and co-chair of the Global Education Leaders Partnership (GELP)) presents and captures the

interest of the Ministry leading to a radical vision for transforming education in BC.

- John Abbott (director of the 21st-Century Learning Initiative), another key influence.
- No BCTF involvement (in job action).

2011

- New vision for curriculum is solidified in BC's Education plan (note that this document provides no mention of Indigenous people or reconciliation or Indigenous ways of knowing).
- Ministry forms a Curriculum and Assessment Framework Advisory Group to consider curriculum structure, design, and delivery as well as assessment and reporting.
- Other work during this time included researching global trends in curriculum design, how students learn and develop, etc.
- No BCTF involvement (in job action).

2012

- The Ministry brings teams of educators and academics together to advise on the structure in different subject areas including mathematics. The teams discuss goals, rationale, skills, and competencies for these subjects and identify areas of focus for each grade level.
- Know-do-understand model adopted.
- No BCTF involvement (still in job action).

2013

- BCTF called upon to assist in revising the curriculum (no longer in job action).

2014

- Revisions to K–9 curriculum begins with BCTF input.

2016–2019

- redesigned curriculum is gradually mandated, first in K–9, then grade 10, and finally in grades 11 and 12.
- BCTF launches a five-year research project in 2017 to explore curriculum change in BC from the perspective of teachers.

1.2.2. Changes

The Ministry summarizes the foundational shifts that come with the new model:

What and how we teach our students has been redesigned to provide greater flexibility for teachers, while allowing space and time for students to develop their skills and explore their passions and interests. The deep understanding and application of knowledge is at the centre of the new model, as opposed to the memory and recall of facts that previously shaped education around the globe for many decades. (Province of British Columbia, 2020)

Some of the key features introduced with the redesign (2022a) are the Core and Curricular Competencies, the Know–Do–Understand model, and the focus on literacy, numeracy, and the Ministry’s (2022a) claim that, “The redesigned curriculum [...] extends Indigenous perspectives into the entire learning journey”.

1.2.3. Layout

The curriculum website consists of several different webpages. To avoid an overly detailed and possibly redundant analysis, I chose five of these to focus on: the Curriculum Overview, the Introduction to Mathematics page, the Mathematics Goals and Rationale page, and the Grades 2 and 6 grade-specific pages (GSPs). I chose these introductory pages as they are most closely related to mathematics. I chose the grades 2 and 6 GSPs so I could examine samples both of the primary and of the intermediate curricula. In hindsight, to offer a more thorough analysis, perhaps it would also have been helpful to analyse some of the secondary pages. I stayed with grades 2 and 6 as most of my work is with elementary teachers.

The Mathematics homepage on the website looks like this:

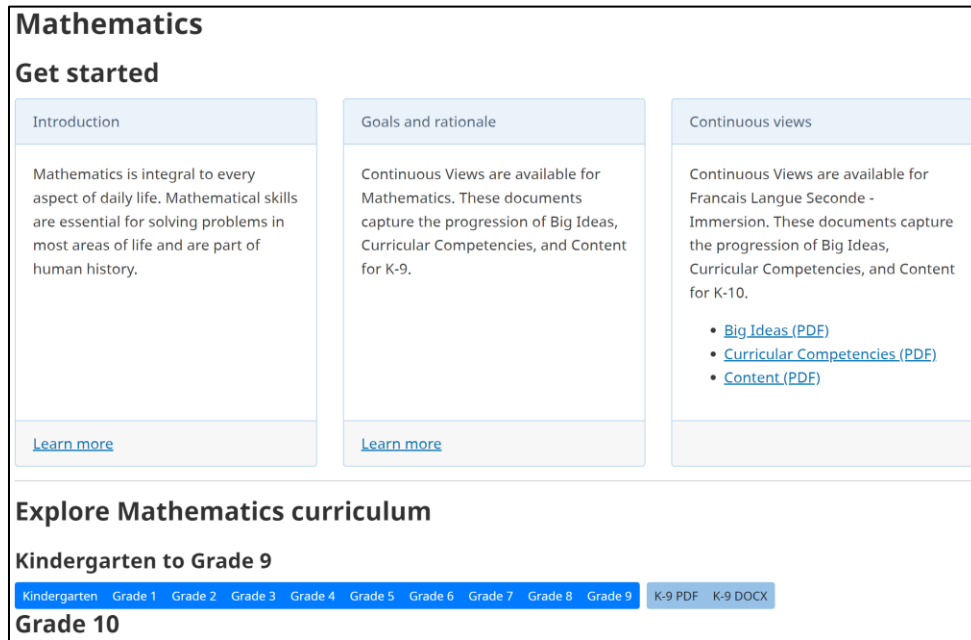


Figure 1.1. Mathematics Homepage on BC Curriculum Website

Retrieved from: <https://curriculum.gov.bc.ca/curriculum/mathematics>

The Introduction, Goals and Rationale, and Continuous Views boxes all link to other pages. Below these sections, under the heading, *Explore Mathematics curriculum*, the reader can select a grade, to view the various GSPs. To illustrate the layout of these pages, the Grade 2 mathematics curriculum is shown in Figure 1.2.

The screenshot displays the 'Mathematics 2' curriculum page. At the top, there are navigation links for 'Background Information', 'Change Grade', and 'Download'. Below this is the 'Core Competencies' section, which includes three tabs: 'Communication', 'Thinking', and 'Personal and Social'. The 'Big Ideas' section consists of five boxes, each containing a key concept and its explanation. The 'Curricular Competency' section is titled 'Reasoning and analyzing' and includes a sub-section for 'Elaborations'. The 'Content' section is also titled 'Elaborations' and lists specific learning objectives, such as understanding 'number concepts to 100' and 'benchmarks of 25, 50, and 100 and personal'.

Figure 1.2. Example of a Grade-Specific Mathematics Curriculum Page (GSP)
 Retrieved from: <https://curriculum.gov.bc.ca/curriculum/mathematics/2/core>

The GSPs are divided into three main sections – the Big Ideas, Curricular Competencies, and Content. The Big Ideas, such as “Number to 100 represent quantities that can be decomposed into 10s and 1s”, are what students are expected to come to understand through learning the content and developing the curricular competencies (which together make up the learning standards). With respect to the know–do–understand curriculum model (which this curriculum is based on), the big ideas represent the *understand* component, while the curricular competencies represent what students should be able to *do* with the content they come to *know*. With this background now in place, I will move to the discussion about how I learned about and decided to conduct a text analysis.

1.3. Text Analysis

I first came across the analytical method of text analysis during my coursework at Simon Fraser University, and I recall saying during class half-jokingly that someone should do a text analysis of our math curriculum. The instructor asked me why, and I explained some of the reasons I thought this could be worthwhile. I later learned that text analysis would not only be a suitable method for analysing the curriculum, but also be helpful, as it would provide me with a set of academic tools with which I could look deeper at the

language in the curriculum. My supervisors introduced me to Michael Halliday's work as a starting point and I found it fascinating. Prior to this experience, my focus had always been on mathematics and mathematics education. My master's thesis was on lesson play (Zazkis et al., 2009) and how teachers respond to hypothetical student misconceptions in mathematics. I had never explored language, especially the way Halliday did – in terms of meaning and choice. I was drawn to Halliday's unique perspective on language as a tool for expressing meaning, and to how analysing text through his metafunctions can reveal so much about the intentions of the speaker/author. The way we speak and/or write carries meanings we may not even be aware of. I proceeded to read and study several of his books and articles, and his work around metafunctions formed the foundation of my analysis. At this time, I was also reading Thomas Popkewitz' work. Although this was not easy reading for me, I was drawn to the idea that language can be used to construct categories of people. Popkewitz presents a more critical approach to language and curriculum analysis and I became quite interested in this.

I decided later to supplement this text analysis with teacher interviews, as this would allow me to explore what kind of alignment existed between the results of the analysis and the experiences of teachers who are mandated to work with this curriculum.

1.4. Structure of this Thesis

The two chapters after this introduction are a review of the related literature, followed by a description of the theoretical tools I use to engage in the text analysis, that ends with the presentation of my research questions. Most of my work draws either directly from the work of Michael Halliday, or from those who have used his work in text analysis. In my review of the literature, I learned so much. This explorative journey has revealed to me that others have come before me questioning what I am questioning. Some have commented on the political motivations behind curriculum design. Some have noticed that curricula often do not account for or consider issues of equity or diversity. Others have observed the Eurocentric nature of many formal curricula, and others again have written about the importance of clarity of language in curriculum documents.

Although Halliday's work formed the foundation of my analysis, I needed to look elsewhere for tools I could use to analyse what I came to refer to as the clarity of the

curriculum documents. I realized that because the pages containing the learning standards are written so differently than the Curriculum Overview and other introductory pages, I would have to do this in two parts. For the introductory documents, I originally framed this in terms of propaganda, as I thought of it in terms of how the curriculum asserted things in a way that seemed to conflate fact and claim. I even looked into the propaganda literature, but did not find a good fit. Eventually I found some work on clarity that ended up being helpful, but I did not want to abandon the issue of fact versus claim mentioned above, so I included an analysis that I hoped would expose the persuasive tone of the introductory pages.

In Chapter 4, I describe how I brought these tools together to analyse the BC mathematics curriculum. The next three chapters are each related to one of Halliday's three metafunctions. I use the interpersonal metafunction to analyse the voice of the text, and the nature of its author and audience; the ideational to consider how the student and teacher are constructed in the text; and the textual to consider how the text hangs together. Following that is Chapter 8 on clarity, which I analyse through text analysis and teacher interviews. In fact, it is this chapter that relates most significantly to the teacher interviews, and then the final chapter is where I reflect on the analysis, and what it reveals about the curriculum. I discuss what I have learned about how the choices made in the writing of the document such as verb tense, use of pronouns, forms of address – function to produce meanings about teaching, learning and mathematics itself.

I would like to note two things at the outset. First, rather than dedicating a chapter to the interviews with teachers, I decided instead to weave teachers' responses to the interview questions throughout the relevant chapters of this paper, as in weaving them through I could consider simultaneously the text as text and the text as how it is experienced by the teachers. Because of this, there are some chapters with no reference to teacher interviews, and other chapters with an abundance of these references.

Second, because the Ministry has concealed the author(s) of the curriculum and its different components, I struggled with how I might ascribe authorship. At first, I used the singular 'author', since 'the Ministry' is singular, but then I would occasionally switch to the plural 'authors' as using the singular did not make sense in some contexts. I finally

decided on using 'the Author' (with 'they' as the corresponding pronoun), where the capital 'A' is meant to signify the Ministry's choice to present themselves as an authority.

Chapter 2. Review of the Literature

Halliday's *Systemic Functional Linguistics* (SFL) has been used extensively in mathematics education research as a theoretical framework for analyzing text. Candia Morgan has done a significant amount of work in this area (e.g., 1996, 1998, 2002) and others have used her work as a starting point for their own analyses (e.g., Herbel-Eisenmann, 2007; O'Keeffe & O'Donoghue, 2015). This literature review begins with an overview of some of these papers to demonstrate how mathematics education researchers have made use of SFL. Next, several mathematics education papers are presented in order, to exemplify how SFL was applied in different ways to a variety of mathematics texts, from word problems to textbooks to curriculum documents. Since SFL is concerned with the context in which text is used, I will also discuss papers that question some of the epistemological and ontological assumptions upon which mathematics curricula tend to be built. These papers do not all use SFL but they provide important context.

Another key idea in Halliday's SFL relates to choice – a text is the result of the author making series of choices. One of the choices that is relevant to my work is the degree of clarity (as compared with vagueness or ambiguity) that an author decides to incorporate into their writing. The next section of this literature review consists of work related to the issue of clarity in formal curriculum documents. After the discussion on clarity, I narrow my focus to a more local context, as this is my phenomenon of interest. I present an overview of a selection of articles and research reports that have been written in response to the redesigned British Columbia (BC) mathematics curriculum.

2.1. SFL in Mathematics Education

Although Morgan has written extensively on mathematics discourse and language, and even on Halliday's SFL, I focus here on Morgan (1996), which includes not only an analysis of students' written work in mathematics, but also the introduction to a tool that can be used for the diversity of mathematical texts. These texts are likely to “differ, not only in their vocabulary, degree of symbolism, and specific content matter [...], but also in the ways in which arguments are made and in the relationships constructed between the author and his or her readers” (p. 2). She notes the wider application of the analytic

tools provided by SFL, including the ability to “interrogate” linguistic data. Morgan proceeds to describe Halliday’s three metafunctions, giving examples related to mathematics education, and noting that the metafunctions correspond to the ways in which mathematical texts tend to differ. Morgan then explains how one of the affordances of this model of language is that it allows us to consider choice in our analysis:

Whenever an utterance is made, the speaker or writer makes choices (not necessarily consciously) between alternative structures and contents. Each choice affects the ways the functions are fulfilled and the meanings that listeners or readers may construct from the utterance. (p. 3)

As described by Halliday (1975), “Text is choice. A text represents a selection within numerous sets of options; everything that is said presupposes a background of what might have been said but was not” (p. 124). Morgan explains that the choices made by the author/speaker reflect their place in the world at the time and as such, will necessarily be limited or constrained in what they say/write.

What I find most interesting about the 1996 paper is the way Morgan uses the metafunctions in her analysis. For example, in relation to the ideational function, she writes:

The central question to be addressed by using the analytical tools discussed in this section is “What is mathematics (as it appears in the text being analysed)?” This general question [...] may include the following more specific issues:

- What sorts of events, activities and objects are considered to be mathematical?
- How is “new” mathematics brought about (or created or discovered?)
- What is the role of human beings in mathematics? (pp. 3-4)

Morgan explains that answering these questions is important, as the answers situate the text philosophically and pedagogically in the world of mathematics education. She then notes the usefulness of examining the transitivity system when considering the ideational function. She explains that this means examining “the types of processes and the types of participants that are active in them” (p. 4). She goes on to describe Halliday’s six main processes (material, mental, relational, behavioural, verbal, and existential), and then

focuses on the first three that are the most common: the material, mental, and relational. After a discussion about these processes, Morgan notes the significance of looking at what types of objects are participants in the texts and how the naming of those objects might impact the nature of those objects, specifically regarding the use of nominalisations – turning processes into objects. She adds that the use of nominalisations can obscure agency: “The transformation of process into object removes the grammatical need to specify the actor in the process” (p. 4). She also points out that agency can be obscured in other ways as well, like using representational objects as actors, or using passive verbs.

Morgan then turns to the interpersonal function as a means of examining the roles and relationships of the author and reader, including consideration of the use of personal pronouns, and the significance of their absence in a text. She notes how the modality of a text – specifically, the expressions of certainty and authority – can also give clues about relations between author, reader, and subject matter.

Finally, Morgan considers the textual metafunction, which she describes as, “the way in which the text is constructed as a coherent, meaningful unity” (p. 7). She suggests starting with the question, “What sort of text is it?” (p. 7) and explains ways of addressing the question through analysis of the text. She then points out that, at least in this instance, learning about one of the metafunctions can inform us about the others. About the question posed above regarding the nature of a text, she writes, “Answers to this question also contribute to the ideational and interpersonal functions of the text” (p. 7). Morgan also discusses cohesive devices and how these are an element of the textual function, but she talks specifically about how reasoning is constructed in the text, and I would consider this more in the ideational arena, so I can definitely see how they might inform each other. Morgan brings this together by providing an example where she analyses a text using the metafunctions described above.

I turn now to two papers in which the authors have used Morgan’s ideas in their own analyses. In the first, O’Keefe & Donoghue (2014) present a framework for mathematics textbook language analysis based on Halliday’s metafunctions, and offer a detailed example of this framework in action. In introducing the framework, the authors outline Halliday’s SFL, including the metafunctions and the processes within the ideational function, and then draw upon Morgan’s work to make a connection to mathematics text

analysis. They note that one major difference between Morgan's work and the analysis presented in their paper is that Morgan used her framework to analyse student text, while the authors here use it to analyse a textbook. The authors draw an interesting conclusion regarding triangulation, where they observe that the findings obtained through analysis using one metafunction are consistent with findings that emerged through analysis using the other metafunctions.

The second paper (Herbel-Eisenmann, 2007), which I think will be more relevant to the work I am doing with the BC mathematics curriculum, is also an analysis of a mathematics textbook, but here the author looks specifically at voice, to "illuminate the construction of the roles of the authors and readers and the expected relationships between them" (p. 344). Herbel-Eisenmann uses language analysis to investigate the degree to which the textbook supports the goals of the NCTM Standards on discourse, noting that, "It is through examination of language patterns in textbooks that ideological and epistemological issues can be scrutinized" (p. 347). Like in the previous paper, Halliday's metafunctions are outlined, but here the author focuses more closely on the interpersonal function, as it is the metafunction concerned mostly with relationships established in a text. The same author then highlights the significance of choice in language, and presents her framework for the analysis, which she acknowledges was developed by Morgan, following Halliday. In introducing the framework, Herbel-Eisenmann explains that she chose it because "it offered a systematic approach to the analysis of subtle and unintended messages of written mathematics texts and thus fits the intent of this analysis" (p. 349).

In examining the interpersonal function, Herbel-Eisenmann considers the use of three linguistic forms: imperatives, personal pronouns, and modality. She explains what these are and why it is important to consider them, and then presents the analysis. What I found most significant is the identification of the text as authoritative, and the linguistic devices she identified that served to construct that voice. For example, the lack of first-person pronouns and the further masking of agency through phrases wherein inanimate objects perform activities that are normally carried out by people. Herbel-Eisenmann summarizes her findings regarding one unit of the text: "the text created an image of the author as being absent. There was no "voice of the author" present, only someone omniscient who dictated what was to be done through the selection of imperatives" (p. 358).

To situate this work, I will now present more general examples of text analysis in mathematics education, followed by an article that was written as a general commentary on mathematical texts.

2.2. Other Text Analysis in Mathematics Education

In this section, I discuss three examples of mathematics text analyses, and an article written about mathematical texts in general. In the first paper, Paul Dowling (1996) – as part of a larger project – analysed two textbooks, and through this process introduced a framework for text analysis, based on Basil Bernstein’s (1995) notion of a language of description. Dowling’s analysis is based on the comparison of two British School Mathematics Project (SMP) textbooks, from what he referred to as the upper and lower series, or the ‘Y’ and ‘G’ series, respectively. He starts by comparing the covers, noting that the two texts “may be described as recruiting different ‘ideal’ readers in terms of their respective relationships to school and everyday practices” (p. 390). The G1 cover recruits a reader who is “concerned with the mundane” and with practical, manual matters, while the Y1 cover recruits a reader who is “concerned with knowledge that they do not already possess, an intellectual reader” (p. 391). Dowling summarizes: “Thus, the SMP scheme constructs a hierarchy of readers which connotes the intellectual-manual opposition in the broader division of labour” (p. 393). His analysis, then, concerns the voice of the two texts. He drew out further differences between the texts by analysing and comparing specific content and problems. Dowling also noted that although this is an analysis of specific mathematics texts, the framework has been extended.

The next paper is David Wagner’s (2012) analysis of a grade 7 mathematics textbook. Interestingly, Wagner analysed a book of which he was a co-author. He shared what he learned from that experience and provides a critical perspective concerning the almost necessarily ‘closed’ nature of mathematics textbooks, even if the author wishes for a more open style. Wagner attributes this challenge to the fact that curriculum standards are for *all* students and are therefore normalizing and closed by nature.

Wagner sets up his analysis by outlining the theoretical background, including but not limited to the notions of open versus closed texts; grammatical features of text such as personal pronouns, modality, and imperatives and the implications of how they are used; appraisal linguistics, and seduction as it relates to the ability of a text to seduce, or lead

away its reader. The author then provides a detailed text analysis of his own writing, concluding that, “the assumption that curriculum outcomes define a right path implies that children are otherwise on a wrong path” (p. 166). Lastly, Wagner presents three possible alternatives or ways of overcoming the “normalizing force of curriculum”, noting that that third seemed the most viable.

For that reason, I will only discuss the third alternative here, which is to challenge the curriculum by challenging the content of the text resources used by students. He writes that this approach, “allows for the possibility of presenting the curriculum while at the same time questioning it” (p. 166). In discussing this third alternative, he notes the ability of the teacher to raise the necessary critical voice, but cautions that, “teachers, like students, are readers of the textbooks they use in mathematics classrooms and are likewise susceptible to being seduced by the text. This is why it is important that the texts themselves avoid seduction by including self-critique” (p. 167).

In the next paper I chose, Kate Le Roux (2008) uses Fairclough’s (1992) *Critical Discourse Analysis* (CDA) to analyse a mathematics word problem from a first-year university access course in South Africa. Le Roux notes that even with a reform curriculum in place in South Africa, “the mathematics text and the text of the school mathematical word problem remain dominant, and position the student in a particular way” (p. 307). She also observed that even though the purpose of the ‘real-world problems’ in the mathematics course is to allow access to mathematics for more students, this may in fact have the opposite effect. She also notes that her analysis illustrates the potential use for CDA in mathematics education research. I found it interesting that aspects of CDA seem to correspond to Halliday’s Systemic Functional Linguistics and it seems the two support each other (as does Fairclough – see Fairclough, 2003, pp. 5, 26–27).

The last paper I will include here is more general and in it Love and Pimm (1996) provide a historical background related to written school mathematics texts followed by a discussion about why they are by nature, problematic. The main ideas are as follows. First, the text’s author, through the text, takes on a position of authority in the class and is at the same time not accountable to the student or teacher. The student and teacher are expected assume a somewhat passive role in the interaction with the text. Second, there is some discrepancy between authentic mathematics and what is presented in the

textbooks: “the authentic mathematics texts somehow changed into teaching material” (p. 374). This relates to Thomas Popkewitz’s (2004) idea of the alchemy of the mathematics curriculum, which I discuss in more detail in the next section.

In the third section of the paper, Love and Pimm discuss what mathematics texts are exactly, and one of their observations relates to the static nature of the text: “Firstly, the text is complete, already finished; it is a presence of past thought available in the present, the temporal location inhabited by teachers and their students” (p. 379). The authors offer a quotation by an academic and novelist David Lodge (1995): “the act of writing is finished with, out of sight, by the time someone reads the result” (p. 379). Love and Pimm note that the textbook allows the past to “make an appearance that all have to orient themselves with respect to, a presence which is immune to theirs” (p. 379). Somehow a textbook is out of date before it is even opened for the first time.

Love and Pimm then suggest some things to consider regarding the voice of the textbook, which they formulate in the following questions: “Who is (are) the author(s) and to what extent do they acknowledge their presence in the writing? What pronoun(s) do they use to refer to themselves and the reader” (p. 380)? They also ask, “What evidence is there for the nature of a presumed ‘ideal’ reader on the part of the author as contrasted with any actual reader” (p. 380)?

The authors go on to consider issues such as the linearity of text, images in textbooks, and the typical cycle of explanation, examples, exercises. They then return to the issue of the model reader, drawing on Umberto Eco’s (1992) distinction between the actual empirical reader and the model reader of a text. “[Eco] provocatively asserts that books are not merely written for a ‘model reader’, going on to claim that, ‘a text is a device conceived in order to *produce* its model reader’ (our emphasis)” (p. 391). The authors caution that, “the teacher will read the text in the light of other textbooks and practices and may use parts of the text in ways far removed from those envisaged by the empirical [as opposed to model] author” (p. 392). This idea of a model author and reader connects with Popkewitz’ notion of the fabrication of human kinds, so I will turn now to the next section, beginning with him.

2.3. Ontological, Epistemological, and Axiological Considerations

In this section, I shift to a critical focus on curriculum. I examine a selection of papers that are more ideological in nature – a selection in which the authors offer a critical perspective. This is by no means an exhaustive list but is instead a collection from which I will draw in my own analysis. I chose these papers because their authors bring to light the ideological assumptions that often form the foundation of school mathematics curricula, and provide some insight regarding the implications of holding those assumptions. Moreover, I think it is important to critically examine any political document – especially in a time of unprecedented corporate power, and climate, social, and political instability.

This discussion begins with Popkewitz (2004), Popkewitz and Lindblad (2004), and Yolcu and Popkewitz (2018), primarily because, in these articles, Popkewitz and his co-authors identify several of what seem to be unifying themes in the papers discussed in the previous section, specifically in relation to the notion of a school mathematics for *all* students, the normalizing power of curriculum, and the transformation of mathematics into school mathematics in order perform such normalizing.

Popkewitz (2004) presents his article as a textual analysis, but not of one specific textbook or problem. Instead, he analyses “the inscription devices related to constructivist and social linguistic research traditions that are cited nationally and internationally in efforts of standards-based reforms” (p. 4). From this analysis he draws several troubling conclusions. The first is that the standards of standards-based reform are not designed to support the learning of a discipline at all, but are instead a means of “making the child legible and administrable for producing the future citizen” (p. 4). He goes on to say that the standards “are in the ordering, mapping, and governing of the internal qualities and characteristics of the child as future citizen” (p. 4). They are an attempt to create a certain kind of person – a problem-solving, lifelong-learning kind of person. In other words, to achieve the goal of controlling and governing, “the imagination of mathematics is translated into the imagination of a pedagogical psychology”, where “the psychological inscriptions focus on the interior dispositions or the soul of the child, fabricating the problem-solving child as a particular human kind for pedagogical intervention” (p. 4).

Next, Popkewitz discusses how the mathematics we teach positions science as being the right or only way. I talk more about this idea when discussing the Yolcu and Popkewitz paper below. Finally, and this last point I think is the most significant, Popkewitz warns that “these various inscription devices of pedagogy embody principles that normalize and divide and thus embody practices of social inclusion and exclusion” (p. 5). In other words, creating a human kind known as a *problem-solving child* or a *lifelong learner* (Popkewitz & Lindblad, 2004) simultaneously creates those who do not fit these human kinds.

The next paper is also about educational reform, but more generally about pedagogical practices. Popkewitz & Lindblad (2004) note that, “embodied in the reforms of education are rules and standards of ‘thought’ about the mode of life that one is to live and should live” (p. 230). So again, this article is about the fabrication of certain human kinds:

Our argument is that the very pedagogical practices that include also exclude as different human kinds are produced. When the phrases all children will learn and no child left behind are evoked, that evocation is of universal norms and values whose principles of action and participation locate the ‘other’ child who is placed outside of the grid of normalcy. (p. 230–231)

In the Yolcu and Popkewitz (2018) article, the authors address many of the same issues. What I found singular with this paper is its focus on rational thought and reasoning.

The enunciation of ‘mathematics for all’, for instance, takes the idea that mathematics is part of daily life as a fact and carries in a continuum of values that differentiates the ‘rational’ body and brings into being principles of a cosmopolitan citizen who ‘sees’ and acts as enlightened and differentiated from others. (p. 253)

According to the authors, the goal of teaching mathematics is to build a reasoning, rationalizing society. The consequence of this universal goal is that “those who are ‘different’ than the desired mathematically able bodies are pathologized and they become both objects of governing and sites for intervention because they lie outside the moral qualities of a reasonable life” (p. 253). The goal of education as is described here is reasoning and rational thought alone – there is no attention or value given to other ways of knowing. This is a European epistemology. Richard Wagamese (2019) described the fallout of this perspective of reason above all else: “The newcomers would

begin to trust the power of their minds over the power of their spirits and they would become lost and lose touch with the Earth” (p. 35).

Valerie Walkerdine (1990) also talks about how the positioning of high-level reasoning as the “assumed pinnacle” of education is itself flawed and sets us up for failure as a society: “When we concentrate solely on the cognitive aspects of performance we fail to engage with certain central aspects of the way in which oppression is experienced” (p. 51). She notes that abstract reasoning is in many ways reserved for the privileged, as those less fortunate may not have time for the hypothetical or symbolic. They might instead be forced to focus more on practical matters of economic necessity – something that Walkerdine says has been classified as lower-level thinking. She wonders, “Do theoretical concepts come with wealth and what if so, does this mean for economic and psychological theories of development and underdevelopment?” (p. 52).

Walkerdine notes that the idea of the natural development of reason in stages from concrete to abstract is actually “a historical product of a certain world-view produced out of European models of mind at a moment in the development of European capitalism dependent on the colonization and domination of the Other” (p. 52). And, as described by Popkewitz, if this ability to reason abstractly (or problem solve) is made to be considered normal, then a category of other-than-normal is simultaneously created. Walkerdine summarizes with a call to action – that we need to move away from this normal/abnormal dichotomy created by First-World, stage-wise developmental models, and move instead towards, “an understanding of development as specific to social and historical circumstances” (p. 55).

Applebaum and Stathopoulou (2017) bring a curriculum studies perspective to mathematics education, noting that, “it is valuable to question basic assumptions and metaphors implicit in current practices and to generate alternatives” (p. 1388). They describe curriculum studies as a field that prioritizes “issues of equity, access, and voice” (p. 1388). What I found most interesting about this article was the discussion about the marginalization of mathematics education as a matter of curriculum.

The debasement of curriculum development to the efficient, backward sequencing of experiences has tended to ignore the important question of how to go about deciding which knowledge is of most worth, who makes these decisions, and the implications of the null curriculum [(defined earlier in the paper as the excluded or neglected curriculum)] for learners and for

society as a whole. It further constructs pervasive invisibility throughout the whole of mathematics education of the ramifications of such debasement, relating issues of equity and diversity to notions of differentiated instruction. (p. 1390)

And this essentially leaves the entire matter of ‘equity and diversity’ on the shoulders of the teacher. Like the papers discussed above, the authors here also draw our attention to the problematic nature of a Western epistemology based on rational thought, specifically as it relates to mathematics.

And one key curriculum question that can no longer be pushed to the side is how very narrow, Western, “rational” conceptions of what mathematics “is” have continued to be wielded implicitly as tools of epistemicide, obliterating alternative epistemologies of number, size, quantity, possibility, shape, algorithmic problem solving, analogic representation, and other extended components of mathematical thinking and living. (p. 1392)

Snaza et al. (2014) reinforce the ideas presented above and suggest that many of the challenges we face as a society and in education are due to a misguided ontology, one that ignores our connection to the non-human world and instead focuses exclusively on the rights of the human. They talk about the implications of this:

For if one had rights simply by virtue of being human, then *not being recognized as human*—something that women, black slaves, and colonized natives faced with horrifying regularity—was enough to relegate these inhumans to the status of things, objects to be used by humans. Enlightenment thinkers like Rousseau and Kant returned to Plato to insist that the human *is* not simply a being that is, but something that some beings can *become* through education. (p. 42)

The authors later note that another consequence of this ontology is political in that it produces a school system that implicitly teaches society that humans are so special that they can do what they like with animals and the land. “Anthropocentric politics are concretized in the notion of dominion, which allows humans to view animals and the environment as objects given by God for humans to do with as they wish (Smith, 2011)” (p. 46).

Snaza et al. offer this paper with the intention of bringing post-humanism into the conversation about curriculum studies. They claim that post-humanism “can transform educational thought, practice, and research in three related ways” (p. 40) and set out to explain these. I am particularly interested in the second way they propose, which is that post-humanism “allows us to reframe education to focus on how we are always already

related to animals, machines, and things within life in schools” (p. 40). Bringing the focus back to relationship can connect students to place and could potentially have a role in reconciliation, as it honours or at the very least acknowledges Indigenous ways of knowing/being.

Also in this article, the authors like those mentioned in previous sections, talk about the over-emphasis in education on cognition and the rational mind:

Schooling (among other technologies) attempts to tame our wild animal impulses early on, preparing the way for us to spend long hours in confined spaces [...], *training our attentions away from the body and toward forms of “rational” thought [emphasis added]*. (p. 45)

They conclude that our next step as humans is to start considering ourselves not only as humans but as beings that are “in relation to myriad other entities in the thick relations of being-with” (p. 51). They note that to do this, we will have to:

look beyond and outside of dominant Western European philosophies of knowledge to the indigenous, non-Western (non-Northern), non-white, non-masculinist, non-humanist, non-hegemonic ontologies and epistemologies that Western humanism has systematically attacked. (p. 51)

Returning to mathematics education more specifically, Paul Ernest (2021) takes a slightly different angle on the issues discussed in this section, arguing that the problem lies in society’s overvaluation of mathematics. He describes three ways this overvaluation causes harm. First, the process of learning mathematics can have a negative impact on many students; second, mathematics acts as a gatekeeper, systematically filtering students out of programs or schools that would help reach their life/career goals. Third, learning pure mathematics can lead to potentially damaging or destructive ways of thinking.

Ernest argues that the actual use value of mathematics in society is limited, and that most students do not need more than ‘numeracy plus’, which is the mathematics they will use in their everyday lives. Regardless, society considers mathematical expertise a necessary condition for academic success. This overvaluation results in all students being forced to take high levels of mathematics. Hence, school mathematics becomes a filtration device. Further, he notes the correlation between school mathematics and socio-economic status or social class. So, school mathematics perpetuates inequality.

There is a common theme among the papers in this section. We have an education system based on European thought and values, that treats all students the same and renders invisible the opportunity gaps that are the inevitable result of a society that caters to a very particular privileged human kind – the poverty-free, disability-free, heterosexual, white European settler male. This brings to mind Marilyn Frye’s (2000) birdcage metaphor:

Consider a birdcage. If you look very closely at just one wire in the cage, you cannot see the other wires. If your conception of what is before you is determined by this myopic focus, you could look at that one wire, up and down the length of it, and be unable to see why a bird would not just fly around the wire any time it wanted to go somewhere. [...] It is only when you step back, stop looking at the wires one by one, microscopically, and take a macroscopic view of the whole cage, that you can see why the bird does not go anywhere; and then you will see it in a moment. It will require no great subtlety of mental powers. It is perfectly *obvious* that the bird is surrounded by a network of systematically related barriers. (p. 12)

Requiring all students to live up to the European fabrication of the rational problem-solving child, regardless of their background or circumstance, is another wire on the cage – one more barrier.

To close this section, some words offered by Richard Wagamese:

The great forgotten truth of our reality as a human species is that we all came from somewhere. We all began our cultural journeys somewhere on the planet and because of that we are all Indigenous to her. Everyone. But we learned to use our minds. We learned to think, to rationalize, to know fear and to be protective. When we learned that, we learned separation. And as we practiced separation we learned dislocation and disharmony. [...] We learned to exist for the grand illusion—that we can control things on the planet. [...] The story of the human family is the story of separation from the teachings of the planet, separation from each other and separation from the truth that we are all tribal peoples. (2019, p. 87–89)

I draw on many of these sources in my analysis, mainly to highlight the choices that the Ministry made that form the foundation of the BC mathematics curriculum, and to show that other choices were available. In the next section, I turn to another category of choices – those related to the level of clarity in curriculum.

2.4. Clarity in Curriculum Language

The next three selections included in this literature review speak to clarity of language in formal written curriculum documents. In the first paper, Ewa Bergqvist and Tomas Bergqvist (2017) present their examination of how a standards-based reform in mathematics in Sweden was conveyed in the formal curriculum. They consider two research questions: *To what extent is the reform message present in the formal written curriculum?* and *How clearly is the reform message conveyed?* The authors begin by distinguishing between assimilation and accommodation of a reform message, where assimilation is more of a surface level uptake and accommodation involves a deeper re-thinking of one's practice. They discuss how common it is for teachers to assimilate a reform message, and outline conditions that need to be met to minimize this risk; specifically, teachers need to feel challenged and need to be supported so that they have the time and resources to develop an understanding of the reform message and how to implement it in the classroom.

What is relevant to my research is their second research question pertaining to clarity. The authors draw on previous research to conclude that, "The strongest result regarding aspects of the formal written curriculum is that the reform message has to be *clear*" (p. 153). They then go on to explain that this is the case, because vagueness can lead to different interpretations of a message and to teachers not feeling like they need to change. The authors also note that the goals of the reform need to be clarified through definitions, examples, and explanations. They point out that many studies have found curriculum documents to be "vague and ambiguous" (p. 153). They also note the importance of alignment, specifically, the importance of different parts of the curriculum conveying the same message. To address their second research question, the authors "examine to what extent concepts that are used in the formal curriculum [...] are *defined, explained, exemplified, characterized* and/or *unambiguous*" (p. 158; *italics in original*). Based on these criteria, they conclude that the reform message in the formal curriculum had not been communicated in a clear way.

In the paper just discussed, Bergqvist and Bergqvist (2017) cite Graybeal (2010) in stating that, "teachers might not feel obligated to follow vague messages" (p. 163). Indeed, Christy Graybeal observed that sometimes teachers feel obligated to enact the messages presented in textbooks or curriculum documents but sometimes they feel they

can ignore these messages. The author conducted a qualitative study to explore what factors might influence whether teachers enact these messages or not. She worked with five experienced teachers, collecting observations and conducting surveys and interviews. The main finding of the study was that teachers felt obligated to enact the messages presented in textbooks, assessments and curriculum documents, “when there were clear and consistent messages both within and across resources”, whereas, “Teachers felt they could use their discretion and ignore vague, inconsistent and controversial messages” (p. 1).

To conclude this section on clarity in curriculum innovation, I turn to Michael Fullan (2015), who offers much background and detail clarity in curriculum design. He draws on previous research to highlight the implications of a lack of clarity: “Abstract goals, combined with a mandate for teachers to operationalize them, resulted in confusion, frustration, anxiety, and abandonment of the effort” (p. 27). To describe what happens when people think they have changed, but in fact have only assimilated the new message or practice, he introduces the notion of *false clarity*.

Fullan notes that the issue of clarity in reform is not new and that, “problems related to clarity appear in virtually every study of change” (p. 70). He returns to the notion of false clarity, explaining that, “[it] occurs when change is interpreted in an oversimplified way; that is, the proposed change has more to it than people perceive or realize” (p. 70–71). He offers examples to illustrate this idea, including the following, which speaks directly to Canada’s provincial curriculum revisions:

In Canada, new or revised provincial curriculum guidelines have been dismissed by some teachers on the grounds that “we are already doing that” but this is another illustration of false clarity if the teachers’ perceptions are based only on the more superficial goal and content aspects of the guidelines to the neglect of beliefs and teaching strategies. Similarly, many curriculum guidelines in Canada contain greater specificity of objectives and content than did previous guidelines, with the result that teachers and others welcome them as “finally providing direction.” However, these guidelines may be used in a literal way without the realization that certain teaching strategies and underlying beliefs are essential to implementing the guidelines effectively. (p. 71)

The final section of this literature review outlines a variety of articles that have been written about British Columbia’s redesigned curriculum.

2.5. Connections to the Redesigned BC Mathematics Curriculum

What started me on this journey was a growing curiosity about the language and structure of the BC mathematics curriculum. Along the path, I have developed a deeper understanding of the powerful economic and political forces behind curriculum design. In this final section, I will discuss a handful of articles that speak to this, but that are specifically related to the redesigned BC mathematics curriculum.

The first paper is a criticism of BC's provincial education plan, specifically of its emphasis on personalised learning. Vicheth Sen (2016) presents literature on the dangers of personalised learning, as well as the possible motives for marketing it as good pedagogy:

[Personalised learning] has little to do with pedagogical or curricula innovation and, instead, intensifies a “market logic of strategic consumption for able consumers,” reframing education as a product to be consumed by only some groups that “operate on self-interest and informed private choice” (Praina et al., 2013, p. 657)”. (p. 139)

Sen tells the story of the development of the BC Education Plan and describes the key actors involved, many of whom are major corporate influencers. He notes the shift in education policy-making from being squarely in the domain of government to a “control mechanism driven by a network of state and non-state actors who aspire to a supposedly “shared” understanding of societal problems and preferred solutions” (p. 149). In other words, corporations and others from outside government now have a say in what happens with curriculum, and these outside influencers stand to profit from a technology driven “personalised” curriculum.

Sen traces the origins of BC's education plan to a case study authored by the Global Education Leaders' Program (GELP) of Cisco Systems (a multi-national public technology corporation), noting that GELP was created to enact a whitepaper created by Cisco (p. 147). He highlights the close relationship between Cisco Systems and Pearson Education, their commercial interest in promoting technology-based and online learning platforms, and concludes that by these companies being involved in the creation of the vision for BC's education, we are at risk of “driving public education towards increasing reliance on these private companies for their education product and services” (p. 148).

He reminds us that, “Such companies will benefit tremendously from transforming public education systems towards technology-based personalized learning” (p. 148).

Next is an article by Tara Ehrcke, written in response to the 21st-Century learning initiative that formed the foundation of the redesigned BC curriculum. Ehrcke (2013) argues that the initiative is based on a false premise:

A false narrative about our schools is spreading through the education community and the public at large. Apparently, with the turn of the clock and the dawn of a new century, our schools are suddenly inadequate. (p. 61)

She suggests that rather than being a means of meeting the needs of students in today’s schools, the initiative is instead propaganda meant to further the secret agenda of the project, which is “to replace a public service with a publicly subsidized private education marketplace” (p. 79). This identification of the 21st-Century Learning initiative in BC as propaganda is consistent with what Sen (2016) found in his analysis of the BC Education plan.

Ehrcke outlines Canada’s involvement in this initiative and refers on several occasions to the Canadian organization advocating for the model – *Canadians for 21st-Century Learning & Innovation*. This organization consists mostly of major technology corporations like Microsoft, SMART Technologies, IBM, Pearson, and Nelson Education (“Shifting minds”, 2015), along with members of the educational community who, as Ehrcke puts it, “reinforce the ideas and lend credibility to what is otherwise a profit driven corporate agenda” (p. 65). She notes that BC is one of the first provinces to embrace the 21st Century model, pointing out how the province’s education plan aligns with principles of 21st Century Learning. Consistent with Sen’s (2016) accounting of events, Ehrcke looks to the roots of this initiative in BC and finds that a paper presented by a speaker from GELP may have had significant influence at a BC School Superintendent’s conference in 2009.

The next paper I chose to include is one of several British Columbia Teachers’ Federation (BCTF) research reports written as part of a five-year project, that, according to Andrée Gacoin (2018), “aims to develop a unique, in-depth and contextualized exploration of contemporary curriculum change in BC” (p. 7). In this paper, Gacoin shares the story of BC’s curriculum redesign, from its initial conception by the Ministry in

2009 to teacher involvement in 2013 to the gradual roll-out that began in 2015, making it clear that the framework and vision were firmly in place well before teachers were invited to participate. Although the content and curricular competencies may have been teacher-led to some degree, teachers were instructed to work within the pre-determined framework and structure provided by the Ministry.

Drawing from interviews provided by teachers who were on the design team, Gacoin highlights some of the limitations of 'teacher-led' curriculum design, including joining the project part-way through and not being provided with background information or research related to the framework or vision. Another challenge that several teachers voiced during the interviews was related to Indigenizing the curriculum in a meaningful way: "Team members also raised substantial concerns with how they were able to engage in this work, and how 'not to fall into the trap of tokenism'" (p. 21). Gacoin goes on to list several issues that teachers raised regarding this challenge. The first was how supported the team members felt in their teams as they worked to develop curriculum that authentically incorporated Indigenous world views and perspectives, and this "varied drastically between the teams" (p. 21). The second issue was "what it means for settler teachers to respectfully, and meaningfully, engage with Aboriginal perspectives" (p. 22). The teachers noted that in this context, they were given the time and opportunity to discuss this in depth and detail with support, although it was still not easy.

This is tied to the third issue, which is that teachers will have these same concerns and questions when they begin trying to implement the curriculum, but they may not have access to the same time and support. Gacoin notes that, "Since the curriculum revisions began, the BCTF has advocated for locally developed and readily accessible in-service and learning resources reflective of all 198 First Nations in BC" (p. 23), and he explains that the results of these interviews really showed the importance of these opportunities and resources. Gacoin shares a troubling conclusion: "Crucially, the perspectives and experiences of team members directly contradict the Ministry's claim that 'Indigenous worldviews, perspectives and content have been *built into all* new and redesigned curricula (K-12)' (BC Ministry of Education, 2018, emphasis added)" (p. 23).

Christopher Lamb and Anne Godlewska (2021) performed an analysis of the coverage of Indigenous topics in the previous BC curriculum, and found that Indigenous topics were marginalized, but more relevant here is that in the conclusion they turn to a brief

discussion about BC's redesigned curriculum. While they acknowledge that this curriculum could address some of the issues present in the previous version, the authors echo Gacoin's (2018) findings regarding access to support and resources, and in the end, challenge the Ministry's commitment to real change:

This new curriculum at all grade levels constitutes a significant shift in responsibility to schools and teachers away from heavily prescribed content and delivery methods. Adopting a flexible structure that can be personalized, the new curriculum 'incorporates the Aboriginal voice and perspective' in content at all subjects and grade levels but provides little guidance on how to 'organize the time, space, or methods to teach it' (BC Ministry of Education, 2015a, p. 6). Analysis of the new curriculum is the task of another paper, but making individual educators responsible—consonant with contemporary neoliberal trends in education—and the homogenizing language in the phrasing 'the Aboriginal voice' are two areas of concern that call into question just what the Ministry has learned. Given the picture that emerges through our analysis, educating the non-Indigenous student population, and localizing this education, will require significantly increased resources for educator training and re-training and for Indigenous community capacity building, particularly for Indigenous educators and knowledge holders in the many different places across the province. Given that the BC Government touts the newly introduced curriculum as part of its efforts to implement the principles of UNDRIP, what commitment will the Province, and the B.C. Ministry of Education, make to these kinds of resources? (p.16)

Chapter 3. Theoretical Framework

I was first introduced to Michael Halliday in one of the courses I took during my doctoral studies. As I read his work, I was thinking of the BC curriculum and realizing that it was text that was not just listing content to be taught, but was functioning at multiple levels. I wondered about the language used in the mathematics curriculum and how this language was being interpreted by teachers. I also had questions about the Author and their relationship to the audience of the text. It seemed that the most appropriate way to explore these questions was through text analysis, as this would provide me with a set of tools I could use – one that others have used before me to analyse different aspects of text in mathematics education. I looked briefly at some other approaches to language, but ended up delving into Halliday’s extensive accounts because I wanted to go beyond the content of the text and look at how it is functioning in society.

Michael Halliday (1925–2018) was a British linguist and professor, and the founder of Systemic Functional Linguistics (SFL). Halliday devoted his career to studying language and linguistics from a functional perspective – how language is developed and used to express meaning and relationships, among other things. He was married to Ruqaiya Hasan, also a linguist and professor, and they had a son, Neil, who, according to on-line sources, appeared as ‘Nigel’ in Halliday’s work on early language development (e.g., <https://www.smh.com.au/national/mak-halliday-university-sydney-chomsky-linguists-20180509-p4zeap.html>).

In this chapter, I attempt a rough chronological sketch of the development of Halliday’s SFL. This is not to create an exhaustive list of Halliday’s work, but to acknowledge and discuss some of his most important and influential ideas, specifically in relation to my own research interest. Several specific works written by Halliday have been selected as pillars for this discussion, as they each had something unique to offer. Following this tour of Halliday’s work, the theoretical framework for this dissertation will be introduced and discussed. I chose to use SFL for my analysis of the curriculum because of its focus on meaning and function – SFL looks at the text in terms of what the author is trying to *mean*, as well as how the text is influencing its reader. This would be in contrast to a more traditional word-by-word text analysis. I also chose SFL as it has been used by others in mathematics education research (see Chapter 2).

Perhaps it makes sense to begin by noting that Halliday was among the first in his field to look at language from a functional rather than a structural perspective. We can think of the functional perspective as how the language functions in society (what effect the language is having or what the language is *doing*), and the structural perspective as a more grammatical one. According to Wikipedia (2021), the structural view “treats language as a system of structurally related elements to code meaning (e.g. grammar)”, whereas the functional view of language sees it “as a vehicle to express or accomplish certain functions, (e.g. making a request, giving information or asking for information)” (“Language pedagogy”).

Robin Fawcett (2008) describes Halliday’s work as revolutionary in shifting the focus of linguistics away from what at the time was “a narrowly structuralist view of language”, towards a view that was more meaning-centred and focused on choice, but “choices between **meanings** rather than between **forms**” (p. 10). Halliday (2003) described language as a system of meaning, specifically one in which meanings are created and exchanged. His work was influenced by his teacher and doctoral supervisor, John Rupert Firth, as well as Bronislaw Malinowski, and the sociologist Basil Bernstein. Halliday’s functional view of language development contrasted Noam Chomsky’s more structural approach (Fawcett, p. 9), although some considered the two perspectives complementary (Bavali & Sadighi, 2008).

3.1. Learning Halliday Through his Writing

This journey begins with two of Halliday’s books that are part of the series *Explorations in Language Study*. The first book (1973) is *Explorations in the Functions of Language* – a collection of five papers that have in common a functional approach to the study of language which, according to Halliday means:

investigating how language is used: trying to find out what are the purposes that language serves for us, and how we are able to achieve these purposes through speaking and listening, reading and writing. But it also means more than this. It means seeking to explain the nature of language in functional terms: seeing whether language itself has been shaped by use, and if so, in what ways. (p. 7)

In other words, a functional approach means looking at language in terms of how we use it – even in the very early stages of learning language (or perhaps especially then) – to

meet our needs, and how the fact that we develop language to do something or to mean something, might have impacted what language has become.

In this book, we also find an introduction to what, at the time, Halliday referred to as *functional components* or *semantic functions* of language, which he later renamed as *metafunctions* (for example, see Halliday, 2003, 2014). He described these functions many times and in different ways over the years, but it is the definition he offered in this book that I find the most helpful, in terms of understanding what the metafunctions are and how they can be used to categorize and analyse text:

The ideational component is that part of the grammar concerned with the expression of experience, including both the processes within and beyond the self—the phenomena of the external world and those of consciousness—and the logical relations deducible from them. The ideational component thus has two sub-components, the experiential and the logical. The interpersonal component is the grammar of personal participation; it expresses the speaker's role in the speech situation, his personal commitment and his interaction with others. The textual component is concerned with the creation of text; it expresses the structure of information, and the relation of each part of the discourse to the whole and to the setting. (1973, p. 99)

The processes within and beyond the self that Halliday was referring to are the *material*, *mental*, *relational*, *behavioural*, *verbal*, and *existential* processes, but he emphasized that the first three are the main processes in the transitivity system (2014, p. 215). For this reason, I will elaborate on these processes only. Halliday noted that the primary distinction regarding our experience of the world is between inner and outer experience. Inner experience is our own consciousness – our perceptions, emotions, imagination and so on, whereas our outer experience is what is going on 'out there' – so actions and events.

It is these components, respectively, that Halliday referred to as the *mental* (inner experience) and the *material* (outer experience). And within these inner and outer experiences, He observed another process that is necessary in describing how these events relate to each other – the *relational* process. Halliday (2014) noted that together, these three components constitute a “coherent theory of experience” (p. 214). In *Explorations in the Functions of Language*, Halliday described the metafunctions as categories of meaning potential, and noted that, in almost every instance of text, the speaker/writer will draw on all three components.

I would like to turn momentarily from the discussion of Halliday's writing to some clarifying information about the metafunctions, as they can be tricky to understand at first. In his 2016 presentation, *Introduction to Metafunction*, Dr. Jed Hopkins from the University of Hertfordshire described the metafunctions using examples and everyday language. This presentation proved critical in the development of my understanding of the metafunctions, and I returned to it again and again.

Hopkins described the ideational function as the metafunction concerned with being about something – language that represents processes that take place in the external and/or internal world. He offers the example of “The cat sat on the mat”, noting that there are participants and processes involved (namely the cat sitting, and the mat), as well as spatial descriptors (on). This could also have involved an internal component: “I *thought* the cat sat on the mat”, This metafunction also includes language that links two ideas together: “The cat sat on the mat, **so** we mustn't assume [...]”.

Hopkins described the interpersonal function as language that can be used to express the author/speaker's involvement. He noted that, “we can comment on things, we can evaluate things, we can have attitudes”, and explains that language can express this. To connect the ideational and interpersonal metafunctions in terms of a text, he explains that who we are accompanies the content or aboutness of what we say.

Finally, in describing the textual metafunction, Hopkins noted that this set of language resources is used for creating texts. These are the resources that create and maintain the organisation and flow of the text. It is what gives the text its texture, or coherence – what makes it 'hang together'. This is language for creating cohesive texts.

3.1.1. Learning How to Mean

In the second book, *Learning How to Mean: Explorations in the Development of Language* (1975), Halliday used the functional approach described above to explore how a child learns language. According to Halliday (1975), children develop language in their quest to learn how to mean, and they use this language for a specific purpose in a specific social context. Although the story of how a child develops language is outlined in both books, it is described in detail in *Learning How to Mean*. Here, Halliday described language in the adult linguistic system as a range of options in meaning, and noted, as

in the previous book, that these options can be grouped into three distinct categories (what he termed the metafunctions). He was interested in how these metafunctions of the adult linguistic system relate to how children first develop language: “We can take account of this functional organization of the semantic system of the adult language in helping us to determine what are likely to be the developmental functions from which the child starts” (1975, p. 17).

Halliday framed his work on language and linguistics around the premise that children develop and use language for specific purposes. “The child knows what language is because he knows what language does. [...] Language is, for the child, a rich and adaptable instrument for the realization of his intentions” (1973, p. 10). To adopt a functional approach to early language development, Halliday suggested and described the following set of functions that could be used to interpret the language of a very young child:

1. Instrumental – the ‘I want’ function (language to satisfy a material need)
2. Regulatory – the ‘do as I tell you’ function (language that controls behaviour)
3. Interactional – the ‘me and you’ function (relationships)
4. Personal – the function related to the expression of the self and personality
5. Heuristic – the ‘tell me why’ function (the use of language to explore and learn)
6. Imaginative – the ‘let’s pretend’ function (1975, p. 19)

Like the metafunctions in the adult linguistic system, this set of functions allows us to interpret the language of the child. Each function holds within it a range of options in meaning from which the child can draw. Unlike the adult system however, a child will generally use language exclusively from one function at a time. An instance of text from a child will usually not embody all of these functions (1973, p. 42).

Another interesting note about *Learning how to Mean*, is that Halliday challenged what at the time was the dominant focus of the field: the question of how the child acquires structure: “The implication has been that the learning of structure is really the heart of the language learning process” (1975, p. 1). Halliday (1975) suggested that structure is not the central issue at all, and that instead,

The fundamental question is, ‘How does the child learn language?’ In other words, how does he master the adult linguistic system—in which grammar is just one part, and structure is just one part of grammar? How does he build up a multiple coding system consisting of content, form, and expression: a system of meaning relations, together with their realization

as configurations of words and structures and the realization of these in turn as phonological patterns? (p.3)

Halliday (1975) argued that, in learning language, the child is also “learning to be and to do, to act and interact in meaningful ways. He is learning a system of meaningful behaviour; in other words, he is learning a semiotic system” (p. 15).

Finally, in *Learning How to Mean*, Halliday defined what he meant by a *text*. I found this helpful as, when I had first heard of ‘text’ analysis, I understood a ‘text’ to be a written document – some instance of writing. Halliday held a much broader view and considered text to be, “the language people produce and react to, what they say and write, and read and listen to, in the course of daily life” (p. 123). In other words, a text is “any instance of language that is operational” (p. 123). Halliday has defined text elsewhere as well. I found the following definition to be particularly helpful as I was trying to get used to Halliday’s conception of a text:

The term ‘text’ refers to any instance of language, in any medium, that makes sense to someone who knows the language; we can characterize text as language functioning in context (cf. Halliday & Hasan, 1976: Ch. 1; Halliday, 2010). Language is, in the first instance, a resource for making meaning; so text is a process of making meaning in context. (2014, p. 3)

Halliday (1975) went on to explain that text has two essential properties: meaning and choice. A text is not made of words, but of meaning, and it represents a selection from many options. This leads to the important conclusion that, “everything that is said presupposes a background of what might have been said but was not” (p. 124). The idea of a text as a series of choices is significant and relevant to the research I am conducting, as each page, line, and word in the BC mathematics curriculum was chosen by someone for some reason. I think looking at what the text could look like had different choices been made (e.g., see Chapter 5) might reveal more about the consequences of certain choices that were made in the text.

Halliday then introduced the ‘meaning potential’ of a text:

Hence a text is a semantic structure that is formed out of a continuous process of choice among innumerable interrelated sets of semantic options. We are referring to the total set of such semantic options as the ‘meaning potential’. (p. 124)

The meaning potential is what can be meant, and this of course depends on the *situation*, which Halliday described as “the medium in which text lives and breathes” (p. 125). He examined the role of situation, culture, and context in what can be meant, and used Malinowski’s notions of ‘context of situation’ and ‘context of culture’ as the starting point for this discussion.

A child is learning how to mean; but meaning takes place in an environment, not in solitude. What is the nature of this environment? On the one hand, it may be thought of as ‘what is going on at the time’: the situation in which the language is actualized and comes to life. On the other hand, it may be conceived of as the social system, with the child himself in the middle of it. (p. 65)

Halliday went on to explain that Malinowski took into account both the situational and the cultural factors, naming the first the ‘context of situation’ and the second the ‘context of culture’. Halliday also noted the concrete nature of Malinowski’s notion of ‘context of situation’, and acknowledged Firth to have, “replaced this with a more abstract account which allows us to interpret the situation as a generalized situation type, or social context” (p. 65). Firth had described the situation as “the environment of the text, of the meanings that are selected or ‘actualized’ in a given instance”, and the culture as “the environment of the system, of the total meaning potential” (p. 65). Halliday concluded that, “we can start from the concept of ‘situation’ and define the context of culture as the set of possible situation types” (p. 65). He presented these ideas in greater detail in later work, one being *Language as Social Semiotic: The social interpretation of language and meaning* (1978), which I turn to now.

3.1.2. Language as Social Semiotic

In this book, Halliday (1978) expanded on his previous work, looking more closely at the relationship between language and context. He described language as the product of the social process, and explained that the title of this book, *Language as Social Semiotic*, means interpreting language within a sociocultural context. Halliday reiterated his idea that language consists of the exchange of meanings, and noted that the contexts in which this takes place have social value: “By their everyday acts of meaning, people act out the social structure, affirming their own statuses and roles, and establishing and transmitting the shared systems of value and knowledge” (p. 2). He then posited that if we are to understand language in functional terms, we need to look from outside the

language first – at the context. From here, He again introduced ‘context of situation’, acknowledging it as Malinowski’s work that had been later elaborated by Firth. Halliday (1978) explained that the context of situation needs to be taken into consideration because, “we do not experience language in isolation [...], but always in relation to a scenario, some background of persons and actions and events from which the things which are said derive their meaning” (p. 28).

Halliday also introduced the term ‘register’ in this book, to account for “the fact that the language we speak or write varies according to the type of situation” (p. 32). He defined register as, “a set of meanings that is appropriate to a particular function of language, together with the words and structures which express these meanings” (p. 195), and offered an example of a mathematics register:

We can refer to a ‘mathematics register’, in the sense of the meanings that belong to the language of mathematics (the mathematical use of natural language, that is: not mathematics itself), and that a language must express if it is being used for mathematical purposes. (p. 195).

Halliday went on to explain that, “what the theory of register does is to attempt to uncover the general principles which govern this variation, so that we can begin to understand *what* situational factors determine *what* linguistic features” (p. 32). So, we can predict the text to some degree if we know enough about the context of situation. Specifically, we need to know about the field, tenor, and mode of the discourse. Halliday defined these terms often in his writing (e.g., 1975, 1978), but I found the most thorough description in Halliday and Hasan (1985). The authors introduced field, tenor, and mode as a conceptual framework used to describe the context of situation: “These concepts serve to interpret the social context of a text, the environment in which meanings are being exchanged” (p. 12). They defined the three terms as follows:

1. The FIELD OF DISCOURSE refers to what is happening, to the nature of the social action that is taking place: what is it that the participants are engaged in, in which the language figures as some essential component?
2. The TENOR OF DISCOURSE refers to who is taking part, to the nature of the participants, their statuses and roles: what kinds of role relationship obtain among the participants, including permanent and temporary relationships of one kind or another, both the types of speech role that they are taking on in the dialogue and the whole cluster of socially significant relationships in which they are involved?

3. The MODE OF DISCOURSE refers to what part the language is playing, what it is that the participants are expecting the language to do for them in that situation; the symbolic organisation of the text, the channel (is it spoken or written or some combination of the two?) and also the rhetorical mode, what is being achieved by the text in terms of such categories as persuasive, expository, didactic, and the like. (p. 12)

In *Language as Social Semiotic*, Halliday also characterized the situational categories of field, tenor, and mode as a conceptual framework:

Field, tenor and mode are not kinds of language use, nor are they simply components of the speech setting. They are a conceptual framework for representing the social context as the semiotic environment in which people exchange meanings. (p. 110)

In both *Learning How to Mean*, and *Language as Social Semiotic*, Halliday described a correlation, one in which the field, tenor, and mode are associated with the three metafunctions:

the categories of field, tenor and mode, which we are using to describe the semiotics of the situation, are in their turn associated in a systematic way with the functional components of the semantic system. (1975, p. 131)

In both books, Halliday used the example below to demonstrate how this correlation works. Nigel, at one year, 11 months, is interacting with his mother (note: intonation marks in original not included):

Mother [in bathroom, Nigel sitting on chair]: Now you wait there till I get your facecloth. Keep sitting there. [But Nigel is already standing up on the chair.]

Nigel [in exact imitation of mother's intonation pattern, not in a correcting intonation]: Keep standing there. Put the mug on the floor.

Mother: Put the mug on the floor? What do you want?

Nigel: Daddy toothbrush.

Mother: Oh you want Daddy's toothbrush do you?

Nigel: Yes... you (=I') want to put the frog in the mug.

Mother: I think the frog is too big for the mug.

Nigel: Yes you can put the duck in the mug... make bubble... make bubble.

Mother: Tomorrow. Nearly all the water's run out.

Nigel: You want Mummy red toothbrush... yes you can have Mummy old red toothbrush.

Halliday followed this with a description of the situation in terms of field, tenor, and mode:

Field: Personal toilet, assisted [mother washing child]; concurrently [child] exploring (i) container principle (i.e. putting things in things) and (ii) ownership and acquisition of property (i.e. getting things that belong to other people)

Tenor: Mother and small child interaction; mother determining course of action; child pursuing own interests, seeking permission; mother granting permission and sharing child's interests, but keeping her own course in view

Mode: Spoken dialogue; pragmatic speech ('language-in-action'), the mother's guiding, the child's furthering (accompanying or immediately preceding) the actions to which it is appropriate; cooperative, without conflict of goals (1975, p. 64)

He then used this example to illustrate the correlation between the elements of a context of situation and the metafunctions:

Looking at the text, we find that the *field* tends to determine the transitivity patterns – the types of processes [...] and the content aspect of vocabulary. [...] All these belong to the ideational component of the semantic system.

The *tenor* tends to determine patterns of mood, e.g. [mother] imperative (*you wait, keep sitting*) and of modality, e.g. [child] permission (*want to, can*, and nonfinite forms such as *make bubble* meaning 'I want to be allowed to...'); also of person, e.g. [mother] 'second person' (*you*), [child] 'first person' (*you [=I]*), and of key [...]. These are all part of the interpersonal component.

The *mode* tends to determine the forms of cohesion, e.g. question-and-answer with the associated type of ellipsis (*What do you want? – Daddy toothbrush*); the patterns of voice and theme, e.g. active voice with child as subject/theme [...]. All these fall within the textual component of the semantics. (1975, p. 64)

This illustration shows how to some degree, the context determines the text. We almost know the way the mother will speak because of where she is, what she is doing, who

she is with, and who she is in relation to the boy. I think this is the point Halliday was trying to make. He explained the connection between field, tenor, and mode and the metafunctions further:

Now it appears that each of these different components of meaning is typically activated by a corresponding component in the semiotic structure of the situation. Thus, the *field* is associated with the *ideational* component, the *tenor* with the *interpersonal* component, and the *mode* with the *textual* component. (1975, p. 132)

He went on to say that “The meanings are expressed, in their turn, through the medium of the lexicogrammatical system; and hence there is a systematic, though indirect, link between grammatical structure and the social context” (p. 134).

To illustrate the relationship between context and language, Halliday and Martin (1993) presented the following diagrams:

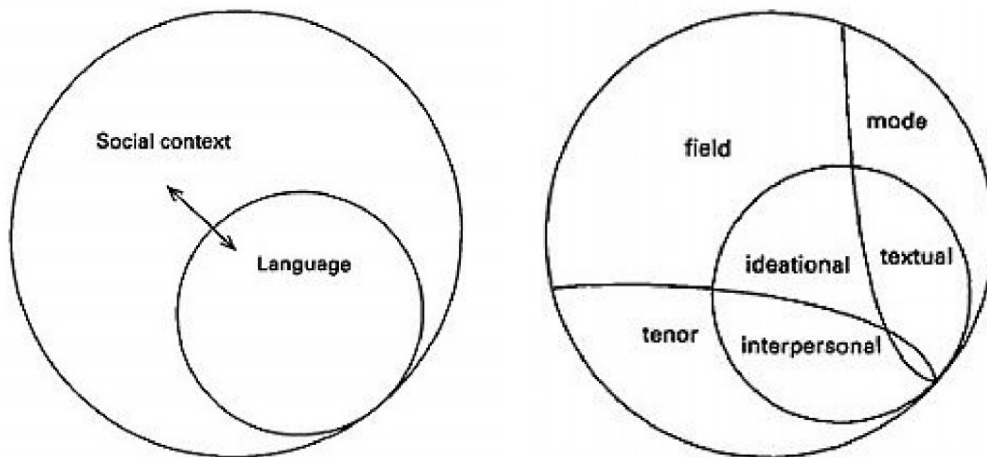


Figure 3.1. The Relationship Between Language and Context

Halliday and Hasan (1985) provided a detailed expansion of these ideas, which is relevant to my research, so I have included that one next as the final book in this discussion.

3.1.3. Language, Context, and Text: Aspects of Language in a Social-Semiotic Perspective

I wanted to discuss this book for several reasons, but primarily because of the thorough accounting the authors provided of Malinowski’s work, including a detailed explanation of

the notions of 'context of situation' and 'context of culture', and because of the descriptions of intertextuality and coherence provided, which I will be using in my analyses.

As mentioned earlier, Malinowski coined the term 'context of situation' and by this he meant the environment of the text. He discovered, though, that this did not necessarily mean the immediate surroundings in which the text was unfolding. These details could in fact be irrelevant. So, the context of situation could also mean a more abstract concept of environment. Halliday gave the example of Malinowski observing storytelling, where "it was irrelevant whether they were being told in the morning or in the evening, outside or inside, or what the particular surroundings were" (p. 7). Malinowski noticed that these stories could still be related to the situation, but in a less direct manner. It was Firth who later took over and modified Malinowski's notion of context situation. Firth was a teacher to Halliday and was also the first professor of general linguistics in a British university. Halliday and Hassan also provided an overview of the different models that have been suggested to describe the context of situation (e.g., models from Malinowski, Firth, Hymes).

This book is also where I found what I consider the clearest description of field, tenor, and mode, along with examples to further clarify for the reader. The metafunctions are also described in detail, along with the following very helpful observation reminding us to take a holistic perspective when using the metafunctions to analyse text:

These strands of meaning are all interwoven in the fabric of the discourse. We cannot pick out one word or one phrase and say this has only experiential meaning, or this has only interpersonal meaning. What we had to do in analysing our text was to go back each time over the whole sentence and examine it again from a new point of view. (p. 23)

The authors also provided a detailed explanation of the connection between the categories of field, tenor, and mode, and the metafunctions. In particular, they noted that the contextual features are expressed through the metafunctions (p. 25). They used an example of a text analysis to demonstrate that:

we can take a particular passage of text, analyse it in terms of its grammar and semantics on the one hand and in terms of the content of situation on the other, and then see how the two relate together. It is this correlation between the features of the text and the features of the situation that

justifies our analysis of the situation in terms of these concepts of field, tenor, and mode. (p. 35)

They chose to use a theoretical model that connects text to situation via the categories of field, tenor, and mode, because, they said, “it helps us to interpret the features that we actually find in the text” (p. 36).

Turning now to ‘context of culture’, the authors recognized that the context of situation is only the immediate environment. They acknowledged a “broader background against which the text has to be interpreted” (p. 46), and followed Malinowski in referring to this as the ‘context of culture’. In the bathroom example above, the context of situation is that a mother and her almost 2-year-old son are in the bathroom together having a conversation about what the child can or cannot have and do. We can infer from the exchange about “Daddy’s toothbrush”, that the father also lives in the house. From the information given, it is not clear what time of day it is or who else might be around. Taking a broader stance and looking at the context of culture, we see an English-speaking family living in some type of home together. The mother is tending to the child and they are having a question-and-answer exchange where the child seems to be negotiating his wants.

Any actual context of situation, the particular configuration of field, tenor, and mode that has brought a text into being, is not just a random jumble of features but a totality – a package, so to speak, of things that typically go together in the culture. (p. 46)

They gave a specific example about schools and education to illustrate context of culture:

For any ‘text’ in school – teacher talk in the classroom, pupil’s notes or essay, passage from a textbook – there is always a context of situation: the lesson [...]; the relationship of teacher to pupil, or textbook writer to reader; the ‘mode’ of question-and-answer, expository writing, and so on. But these in turn are instances of, and derive their meaning from, the school as an institution in the culture: the concept of education, and of educational knowledge as distinct from commonsense knowledge; the notion of the curriculum and of school ‘subjects’; the complex role structures of teaching staff, school principals, consultants, inspectorate, departments of education, and the like; and the unspoken assumptions about learning and the place of language within it.

All these factors constitute the context of culture, and they determine, collectively, the way the text is interpreted in its context of situation. (p. 47)

So perhaps with this understanding of context of situation and context of culture, we can re-draw the image above as follows:

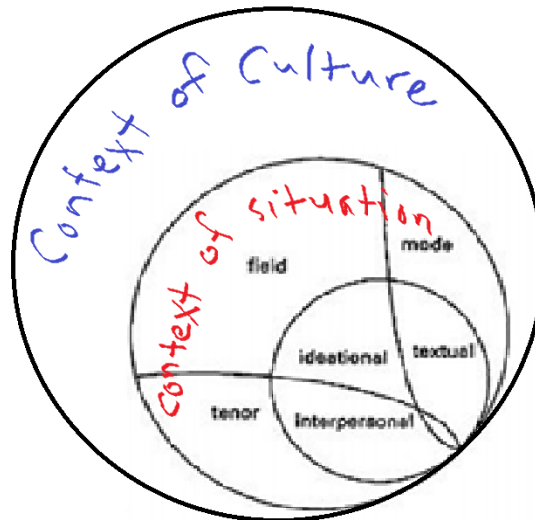


Figure 3.2. Language, Context of Situation, and Context of Culture

Halliday and Hasan (1985) acknowledged that at the time of writing, there was no model available to analyse the context of culture. They suggested that, instead:

In describing the context of situation, it is helpful to build in some indication of the cultural background, and the assumptions that have to be made if the text is to be interpreted – or produced – in the way the teacher (or the system) intends. (p. 47)

In my analysis, I plan to heed their advice and offer a rough description of the context of culture, but only for the purpose of clarifying the context of situation.

Turning now to the notions of intertextuality and coherence, Halliday and Hasan introduce intertextuality as the way most text relies on the assumption that the audience brings with it an understanding of previous related texts: “Part of the environment for any text is a set of previous texts, texts that are taken for granted as shared among those taking part” (p. 47). The authors offer a helpful example taken from what typically happens in schools:

Every lesson is built on the assumption of earlier lessons in which topics have been explored, concepts agreed upon and defined; but beyond this there is a great deal of unspoken cross-reference of which everyone is largely unaware. (p. 47)

The authors then discuss the notion of coherence, which can be understood as intertextuality within the text.

A text is characterized by coherence; it hangs together. At any point after the beginning, what has gone before provides the environment for what is coming next. This sets up internal expectations. (p. 48)

They then introduce cohesion as, “the set of linguistic resources that every language has (as part of the textual metafunction) for linking one part of a text to another” (p. 48). One cohesive device discussed is the *cohesive tie*. The authors note the importance of this concept to any discussion of texture, and offer the following explanation and diagram:

The term itself implies a relation: you cannot have a tie without two members, and the members cannot appear in a tie unless there is a relation between them. [...] If you think of a text as a continuous space in which individual messages follow each other, then the items that function as the two ends of the tie—the A and the B—are spatially separated from each other; A may be part of one message and B part of another. But there is a link between the two, depicted above by the two-headed arrow. The nature of this link is semantic: the two terms of any tie are tied together through some meaning relation. (p. 73)



Figure 3.3. A Cohesive Tie

Halliday and Hasan, in discussing the notion of coherence in relation to classroom textbooks, make an important point about cohesion, which is that:

Every sentence may be impeccable in itself; but if the preceding sequence of sentences does not provide a context with which what follows can cohere then the effect will be one of confusion: not simply ‘I can’t understand this’, but ‘I can’t understand what it is I can’t understand’. (p. 48)

They summarize by noting that, “Each element in the discourse, whether just one phrase or an entire chapter or a book has a value (1) as text, in itself, and (2) as context, to other text that is to come” (p. 48).

3.2. Halliday and the BC Mathematics Curriculum

Many mathematics educators and researchers have used Halliday's SFL as a theoretical framework for textual analysis (e.g., Alkhateeb, 2019; Herbel-Eisenmann, 2007; Morgan, 1996, 2006; O'Keeffe & O'Donoghue, 2015). Through their use of the analytical tools provided by this framework, these researchers have shown Halliday's SFL to be a powerful model for textual analysis. Following their lead, I plan to use the same theoretical framework to study and analyse the redesigned British Columbia mathematics curriculum. I believe this will be a useful theoretical framework for my text analysis, mainly because of the affordances it offers in its adoption of a social and functional stance regarding text and language. The model acknowledges the influence of culture and context on language and provides specific tools we can use to describe the context of situation, to deconstruct language in terms of content, voice, and structure, and finally, to say something about the relationship between the context and the language. As the curriculum is an extremely complex document in terms of the different actors involved, the timelines, the rollout, etc., I think a tool for analysis of such a document would have to be able to connect the social environment to the language, and analyse the text in a way that exposes those connections.

For my analysis, I will take the curriculum as it is presented on the different pages of the website (including hyperlinks and images) as the text. I analyse the curriculum both within and across the different webpages, using all three of Halliday's metafunctions. I use the interpersonal and ideational functions to examine the voice of the text, and to explore how other people referred to by the text are conceived and constructed. I then use the metafunctions to analyse the style of the text. An analysis of voice using the interpersonal and ideational metafunctions help me better understand the author/audience relationship that exists in the curriculum, and how the Author positions themselves and others. An analysis of style using the metafunctions will reveal information about the clarity of language chosen in the text, as well as how different parts of the text relate to each other and to the whole document. Specifically, I will attempt to use Halliday's metafunctions to address the research questions which are posed in the next section.

3.3. Research Questions

I will end this discussion of the related literature and theory with my research questions. Formulating these questions was not easy, as there are so many aspects to analysing a complex document like a curriculum. Also, as I wrote in the introduction, I started this journey with questions in mind, but this list of questions expanded and changed as I read and learned more about the topic. My primary aim is to see what I can learn about the mathematics curriculum through the use of an appropriate theoretical framework for text analysis. My hope is that I will gain insight into some of the language choices and ideological assumptions that were made in the writing of our redesigned mathematics curriculum. I hope to contribute to the field of mathematics education and curriculum development by addressing the following research questions:

1. What can we learn about the Author and audience of the BC mathematics curriculum (and their relationship) by using Halliday's metafunctions to examine the voice of the text?
2. What does an analysis using these metafunctions reveal about how the various people referred to by the text (teachers, students, parents, etc.) are conceived or constructed?
3. How clearly is the redesigned mathematics curriculum communicated?

Chapter 4. Methodology

This chapter opens with a description of my research and analysis. The research reported in this thesis was conducted in two parts: the first component was a two-part text analysis of the redesigned BC mathematics curriculum, and the second was the interview component. In this chapter, these are attended to in two sections. In both sections, an outline of how data were collected and analyzed is presented and, for the interview component, participants and recruiting methods are described.

4.1. Text Analysis

As mentioned above, for both text analyses, the following sections of the redesigned curriculum were examined:

- Curriculum Overview (<https://curriculum.gov.bc.ca/curriculum/overview>)
- Mathematics – Introduction
(<https://curriculum.gov.bc.ca/curriculum/mathematics/introduction>)
- Mathematics – Goals and Rationale
(<https://curriculum.gov.bc.ca/curriculum/mathematics/goals-and-rationale>)
- Mathematics – Grade 2
(<https://curriculum.gov.bc.ca/curriculum/mathematics/2/core>)
- Mathematics – Grade 6
(<https://curriculum.gov.bc.ca/curriculum/mathematics/6/core>)

The Curriculum Overview, Introduction to Mathematics and Goals and Rationale sections were included in this analysis as they give the reader an overview of the redesigned curriculum in general, and the mathematics curriculum in particular. I chose to include the Grades 2 and 6 mathematics curriculum pages as they provide a sample of what the GSPs look like.

4.1.1. Analysis #1 – The Metafunctions

For the first text analysis, Halliday's metafunctions was used as a theoretical framework. To perform such an analysis in the domain of mathematics education, I began with the intention of using an analytical framework adopted by Herbel-Eisenmann (2007), but that, she noted, was developed by Morgan (1995, 1996), following Halliday. I chose this framework as I was not sure how to apply Halliday's theory directly on such a detailed level. Herbel-Eisenmann (2007) conducted a discourse analysis examining the 'voice' of a mathematics textbook. She followed Morgan (1996) in using Halliday's metafunctions as her framework, but focused primarily on the interpersonal function.

Herbel-Eisenmann analysed the interpersonal aspect of the text in terms of imperatives, personal pronouns, and modality. She then described aspects of the ideational and textual functions that "relate to the construction of the reader" (2007, p. 349). Working with this framework to explore interpersonal aspects of the curriculum revealed information about the nature of the text that allowed me to customize my own way of analysing the text with respect to the other metafunctions. This was important, as analysing mathematics curriculum is different from analysing mathematics text (in a textbook or student work) and I was finding it difficult to see how to transfer Morgan and Herbel Eisenmann's ideas. Below are the details of how I conducted my analysis.

The Interpersonal Function

Because the interpersonal function is about relationships between the author and reader and their roles, I was interested in features of the language that would reveal information about this. I attempted to answer the questions, "Who is the audience of this text and what is their relationship to the Author?".

In following Herbel-Eisenmann (2007), I began my analysis by conducting a word count in the five sections I analysed. I searched for personal pronouns such as *I*, and *you*; for imperatives – which Herbel-Eisenmann (2007) describes as commands, like "suppose", "define", and "graph" – and for words that might indicate modality or level of certainty. Locating imperatives proved to be more involved than simply performing a word search as there are numerous imperative verbs that one could potentially search for. Doing a search related to modality also proved difficult, as words that could show modality relevant to the roles and relationships constructed in the document, often do not. For

example, the word 'will' could be used as a modal verb in phrases such as, "students will learn about", but it could also be used in ways that do not tell us anything about these relationships, such as, "Each community will have its own unique protocol". To complicate matters further, a strong sense of certainty can also be portrayed by the lack of hedging words.

In the initial word search, I noticed very few personal pronouns. Morgan (1996) notes that the lack of personal pronouns can obscure the presence of human beings in the text. She observes that to obscure agency, authors also use the passive voice, or write sentences where representational objects are actors in verbal processes – what Herbel-Eisenmann (2007) refers to as "animating the inanimate" (p. 358). I also found no imperatives.

As searching the documents for particular words was not providing as much information as I had hoped, I decided instead to take a more holistic approach and analyse the pages sentence-by-sentence. I looked for two types of sentences (based on Morgan's observation above, that authors often use the passive voice, or they animate the inanimate and these techniques obscure agency): I looked for sentences in which the Author "animates the inanimate", and sentences written in the passive voice – and I accounted for the fact that some sentences fall into both categories. I also counted the number of sentences that contained hedging words or hedged phrases, as authors can use certainty in their language to position themselves as an authority.

The Ideational Function

To analyse the text in terms of the ideational function, I considered the processes and participants of the text. I did this on two levels. First, I re-examined the data mentioned above with the ideational function in mind. Second, I considered the ways the Author constructs and portrays images of the teacher, the student (both as the problem-solving child and as a future citizen), and the reader (the teacher, the stakeholders, and the public).

To re-examine the data previously collected for my analysis of the interpersonal function, I looked for sentences that involve the Author either animating the inanimate in the text or using the passive voice, as these techniques conceal the participants and their role in

the processes of the text. I then attempted to rewrite some of these sentences without these obfuscations, to provide some clarity around what they really entail.

For the second part of the analysis, I bring a critical perspective by examining the ideological foundations upon which the curriculum is built. This is primarily related to the ways in which the Ministry constructs the notion of an ideal child – both through listed expectations and goals, and through their definition of the educated citizen – and what this construction implicitly requires of the teacher. I drew from Popkewitz' work on fabrications to identify the *educated citizen* as a fabricated human kind, and I used the many instances of the Author animating the inanimate to highlight the implicit assumption that there is an ideal teacher in the background who will be carrying out the actions attributed to *the curriculum* as an actor. I used Eco's (1992) notion of a model or ideal reader – a reader who does not actually exist but is a category, rather – to consider an 'ideal teacher', which is in the same sense a category of general teacher or a fabrication.

The Textual Function

In analysing the text using the textual metafunction, I noticed that there were two aspects of the text that I was exploring: language and structure. With respect to language, I tried to answer the question, "What sort of text is it?" (Morgan, 1996). To do this, I sorted the sentences in the Curriculum Overview, the Introduction to Mathematics, and the Goals and Rationale sections into four new categories: sentences containing statements that are either obvious or can be easily verified, sentences containing unhedged statements that are not obvious and cannot be easily verified, sentences containing hedging words or hedged phrases, and sentences that state expectations of teachers or students. For example, statements like, "Over the past decade, British Columbia's curriculum has integrated Indigenous content into specific courses" (from Curriculum Overview) were placed in the first category, as I can easily verify this statement by researching previous curriculum documents. On the other hand, statements like, "To maintain high achievement, British Columbia must transform its education system to one that better engages students in their own learning and fosters the skills and competencies students will need to success", belong in the second category, as these cannot be verified. I did not analyse the GSPs in this way as the

content of those pages is presented as a series of sections and lists, rather than sentences. I return to how I analysed these pages later.

To analyse the structural component, I considered two main ideas from Halliday: cohesion and intertextuality. Halliday and Hasan (1989) explained that what characterises a text is *coherence* – the fact that it hangs together. “At any point after the beginning, what has gone before provides the environment for what is coming next” (p. 48). The authors added that an integral part of coherence is *cohesion*, which they define as the set of linguistic resources available for linking one part of a text to another. *Intertextuality* is related to cohesion as it has to do with how ideas carry across texts. According to Wikipedia (2022), it “concerns the factors which make the utilization of one text dependent upon knowledge of one or more previously encountered text” (“Text linguistics”). In describing intertextuality, Halliday (1989) noted that, “part of the environment for any text is a set of previous texts, texts that are taken for granted as shared among those taking part” (p. 47).

I applied these ideas both within and across the pages I analysed. As teachers look primarily at the GSPs for their planning, I attended mostly to these and their relationship to the other pages.

4.1.2. Analysis #2 – On Clarity

For the second text analysis, I analyse the clarity of language in the BC mathematics curriculum in two ways; first, by analysing the clarity of some of the key terms; second, by examining the level of clarity in the learning standards. To analyse the terms, I used an analytical framework unrelated to Halliday and his work. I did this because it speaks directly to one of the issues I am most interested in regarding the redesigned mathematics curriculum – clarity. This framework comes from a study in which the authors examine how the standards-based reform in mathematics in Sweden was conveyed in the formal written curriculum (Bergqvist & Bergqvist, 2017). The second part of the authors’ analysis is related to clarity. They investigate how clearly the reform message was communicated in the Swedish formal written mathematics curriculum, and their method for exploring this question can be summarised as follows:

To examine how clearly the reform message is conveyed in the Swedish formal curriculum, we therefore examine to what extent concepts that are

used in the formal curriculum, and according to our analysis are central in an ability, are defined, explained, exemplified, characterized and/or unambiguous. (p. 158)

They define the reform message to be the first five mathematical abilities from Lithner et al.'s (2010) Mathematical Competency Research Framework (MCRF), as these relate to mathematical processes, and are therefore considered new.

Many of the mathematics curricular competencies coincide with the abilities listed in the MCRF. The curricular competencies are organised into four categories: reasoning and analysing, understanding and solving, communicating and representing, and connecting and reflecting. To apply this framework to my research, I selected key terms from each category:

Table 4-1. Curricular Competency Groups and Selected Terms to Analyse

Category	Term(s)
Reasoning and analysing	reasoning, model (verb)
Understanding and solving	problem, visualize
Communicating and representing	represent
Connecting and reflecting	reflect

The terms, *problem* and *reasoning* were also chosen by the authors. I chose additional terms from the mathematics curriculum as well, including *numeracy* and *know* (as in, “students are expected to know the following”), as well as two phrases: (*mathematical habits of mind*, and *personalized learning*). I chose these terms and phrases because I had a sense of their ambiguity through my own work with teachers and because how teachers interpret these terms could significantly influence how they teach.

In following the work of Bergqvist and Bergqvist (2017), I examined to what extent these terms are “defined, explained, exemplified, characterized and/or unambiguous”, as defined by the authors as follows:

A word is seen as *defined*, *explained* and/or *exemplified* if the formal curriculum contains a definition, an explanation and/or an example, respectively. Whether a *description of the meaning of a word* is a *definition* or an *explanation* might be difficult to determine but for our analysis, it is not necessary to separate these, since either makes the text clearer. A concept is seen as *exemplified* if there is an example in the text. A concept is considered to be *characterized* if the text consists of a wording containing

where the concept is the subject of a sentence or a subordinate clause, for example, ‘Many problems can be solved in direct connection to concrete situations’... A word is seen as *unambiguous* if the definitions of the word in three central Swedish dictionaries coincide and no version of the dictionary definitions is contrary to the MCRF definition. If a single dictionary has more than one main (different) definition, the word is seen as ambiguous. (p. 159)

Because I was analysing a Canadian curriculum, it did not make sense to use the Swedish dictionaries, so I instead used the Oxford, the Cambridge, and the Collins dictionaries based on the recommendation of my senior supervisor. I also went one step further than the authors did in their study, and compared the data collected here with how the teachers understood these terms.

To collect and analyse the data, I performed word-searches for the terms of interest on each of the curriculum pages included in this analysis. I then organised the results in a table using Bergqvist and Bergqvist’s (2017) criteria above to help me identify themes. I did not include instances where the terms/phrases are characterised, as I considered this, and it would have added too much complexity to the analysis – especially because words like ‘model’ have more than one meaning and both meanings are used in different parts of the curriculum. Moreover, it ended up not being necessary to consider whether words/phrases had been characterised as the results of the analysis were clear even without this component. I did, however, notice a few instances of terms being characterised, and I discuss this briefly in Chapter 8.

One drawback of this method of analysing clarity is that it does not allow for the analysis of phrases – only individual words. For example, the phrases “personalized learning”, and “flexible teaching and learning” are ubiquitous in the Curriculum Overview but are not explained or described in a way that could be operationalized in a classroom. I did, however, ask teachers about the phrase “personalized learning” in the interviews. In hindsight, I wish I had also asked them what they thought “flexible teaching and learning” means, as that is one of the core principles of the redesign.

To examine the clarity in the learning standards, I combined the results from the Bergqvist and Bergqvist analysis with a more holistic examination of the learning standards. I did this by looking at the verb/noun structure of the competencies and content, and by examining the level of cohesion in the standards, which Halliday and Hasan (1989) define as, “the set of linguistic resources that every language has [...] for

linking one part of a text to another” (p. 48). Finally, I looked to the teacher interviews to see if their responses aligned with the results of the analysis.

4.2. The Interviews

Through my work as a mathematics helping teacher, I spend a lot of time looking at and studying the curriculum, both within and across grades, and one of the things I have noticed is that much of the language in the mathematics curriculum is not clear to me. I chose to interview teachers for this study because I wanted to know about their experience with the curriculum – if they felt the same way. I was also curious as to whether their responses would align with the results of my text analysis.

The Mission School District is a small district on Stó:lō territory in the Fraser Valley of British Columbia. The district has thirteen elementary schools, two middle schools and one high school, serving about 7000 students. The participants for this study were seven elementary school teachers and one middle school teacher from six schools in the district. Five of the teachers had between ten and thirty years of teaching experience and the other three had one, four, and nine years of experience. I have worked with these teachers through my role in the district.

My recruiting method was to send an email to teachers with whom I have a professional relationship, inviting them to participate in a study. My role as the mathematics helping teacher in the district enabled me to do this. I invited teachers from a range of schools to provide a sample that was representative of the different schools in the district.

The teachers who expressed interest were sent the consent form and invited to contact me if they had any questions about the study. Following this, we arranged times to meet for a virtual interview. Initially, only six teachers expressed interest, but during the interviews they provided similar responses to the questions. To try to include teachers who might have a different perspective, I sought out additional participants. Two more teachers agreed to participate after I emailed them directly, and their responses ended up providing some contrast. It would have been interesting to hear from other teachers as well, but the main focus of this study is the text analysis.

4.2.1. Data Collection

When considering how to interview teachers, a semi-structured format seemed natural. Semi-structured, according to Zazkis and Hazzan (1999), means that, “the interviews are planned in advance but contingent upon the interviewee's response, allowing unplanned follow up questions, variations on planned questions and clarifying questions” (p. 431). Using this format would allow me to enter the interviews with a list of questions, while still providing the flexibility needed to ask spontaneous follow-up questions based on the teachers’ responses. Below is the list of questions along with a brief explanation as to why I chose to ask each of them:

1. How long have you been teaching and what grades have you taught?
This question was to provide the reader with some information about the participants
2. Who do you think the curriculum is written for?
3. Who do you think the curriculum is written by?
I asked questions 2 and 3 to get a sense of who the teachers thought the Author and intended audience were for the document.
4. To what degree do you use the curriculum in your planning and teaching?
I wanted to see if teachers actually use the curriculum
5. What do you think the elaborations are? Do you think they are requirements or suggestions?
In past curricula, the Ministry provided teachers with descriptions of the outcomes but the elaborations are different – they are suggestions, descriptions, and examples. I wanted to find out if teachers knew this.
6. How do you use the curricular competencies in your planning, teaching, or assessment?
I asked teachers this to see if they consider the curricular competencies and if not, why not.
7. What do you think the following curricular competencies mean?
 - a. Visualize to explore mathematical concepts
 - b. Use reasoning to explore and make connections
 - c. Model mathematics in contextualized experiences
8. What do you think the word numeracy means?
9. Is there any language in the math curriculum that you find unclear or that you don’t understand?

Questions 7 - 9 are related to clarity – to determine if teachers understand what is meant by these terms and phrases.

10. If you could revise the math curriculum would you want it to be more specific or more vague and open?

The Ministry talks about how much this curriculum model will offer support and flexibility to teachers. I wanted to see if they appreciate the openness of it.

11. Can you describe one thing you do differently since redesign?

12. What is helpful about the redesign?

13. What is unhelpful about it?

14. What is missing from the math curriculum?

Questions 11-14 are about how teachers feel about and use the redesigned mathematics curriculum.

15. Have you ever looked at the other math curriculum pages?

Much of what the Ministry writes in the GSPs is related to or based on content from the other sections. The purpose of this question was to find out if teachers are familiar with this other information.

16. In the introduction to the curriculum talk about personalized learning. What do you think personalized learning means? Do you personalize instruction?

I asked this because 'personalized learning' seems like another unclear term and I was interested in learning how teachers understand it.

17. Is there anything you want to add?

With this question, I wanted to provide teachers with an opportunity to share in case they had some thoughts or feedback that did not come up through the interview questions.

4.2.2. Data Analysis

To analyse the data, I began by roughly transcribing the interviews. For my master's thesis, I transcribed every word of those interviews and found later that this method was time-consuming and ultimately unnecessary. Learning from this experience, I decided this time to only transcribe those parts of the interviews that were relevant. Once this was completed, I noticed that it was difficult to identify any themes – the data needed to be re-organised in a way that would allow easier comparison between the responses. I

ended up listing each question and then either directly quoting or paraphrasing the participant responses. This allowed me to notice things more easily.

Once I had done this, the next step was to determine how to use this data. Since my dissertation is structured around the metafunctions and then clarity, I decided to sort the interview questions/responses according to the sections where they would fit best. I wanted the results of the interview questions to be interwoven with the results of the text analysis.

Chapter 5. The Interpersonal

As stated in the methodology chapter, this chapter is an attempt to answer the questions, “Who is the audience of this text and what is their relationship to the Author?”. Love and Pimm (1996) also suggest considering the following questions when looking at the voice of a text:

Who is (are) the author(s) and to what extent do they acknowledge their presence in the writing? What pronoun(s) do they use to refer to themselves and the reader? What evidence is there for the nature of a presumed ‘ideal’ reader on the part of the author as contrasted with any actual reader? (p. 380)

Pursuing answers to these questions is worthwhile as they could reveal information about the nature of the author/reader relationship(s). As mentioned in the literature review, in her analysis of a textbook with respect to the interpersonal function, Herbel-Eisenmann (2007) found that, “the text created an image of the author as being absent. There was no “voice of the author” present, only someone omniscient who dictated what was to be done through the selection of imperatives” (p. 358). If the curriculum also portrays the image of the Author being absent (which I will attempt to determine through this analysis), then there are implications for teachers, and indirectly for students.

This investigation was carried out by analysing data from two sources: interviews with teachers and a text analysis of the curriculum documents. One of the main reasons I decided on a Hallidayan text analysis is that it offers a set of tools that can be used to examine how language functions in a given context. I chose to include the interviews as part of this analysis to see if how teachers interpret the curriculum aligns with how the text is functioning.

5.1. The Interviews

Of the interview questions I asked teachers, three are relevant for this chapter:

1. Who do you think the curriculum was written for?
2. Who do you think it was written by?

3. Have you ever looked at the other curriculum pages (the pages that are not the GSPs like the Curriculum Overview, the mathematics curriculum introduction, etc.)?

All eight teachers interviewed said without hesitation that the curriculum was written for them, and they offered a variety of reasons for this; for example, the technical/mathematical language, and that it is a planning guide and is therefore intended for the person planning the lessons/units. There was some confusion however, about who the curriculum was written *by*. Here are a few responses to the second question:

Ch: The Ministry, teachers that they pull into the Ministry and they write it. In Ontario, I know teachers who were pulled in to write it.

A: I would say they might get teachers' input but maybe a lot of it is like doctoral students, more technical writers, I don't know.

T: Well, I imagined it was BCTF and maybe they had some teachers. I don't know who else.

M: I think it's written by teachers and educators at university that teach teachers. I don't think it's all just regular teachers. I think there's some policy makers up there.

Ad: I imagine it was written by educators. I would hope it was written by educators. I'm sure educators in the government.

Al: [pause] I'm guessing someone at the Ministry of Education. I know my mom used to write curriculum so I know there are people up there working on it. I assume it's people who have experience teaching math and therefore a better understanding of the breakdown of the skills.

The fact that the teachers were unsure of who the Author is aligns with the text analysis I conducted, which showed that the Author chose to conceal themselves. That said, the teachers did seem certain that the curriculum was written by a group of people, even though in the documents there is almost no use of 'we'.

Specifically, in the GSPs, which is for the most part the only section of the curriculum these teachers had read, there is no use at all of 'we'. Although I did not ask teachers about this during the interviews, one possible explanation is that teachers might know that curricula generally do not have a single author. Alternatively, the language style could have led them to this conclusion – the use of the passive voice and the lack of personal pronouns, coupled with the authoritative tone of the writing. Two teachers in the

group referred to people 'up there', which again aligns with the text functioning to portray a distant, authoritative author.

The third interview question is relevant because since teachers had only read the GSPs, they may have thought I was referring to the GSPs only when I asked them about "the mathematics curriculum", so going forward I considered their responses as such.

5.2. The Text Analysis

As mentioned in the methodology chapter, I began this analysis by conducting word searches (following Herbel-Eisenmann), but quickly found that these searches were not revealing much, so I decided instead to analyse the curriculum sentence-by-sentence. I looked for two types of sentences: sentences in which the Author "animates the inanimate", and sentences written in the passive voice – and I accounted for the fact that some sentences fall into both categories. I also counted the number of sentences that contained hedging words such as might, could, may, etc., or hedged phrases such as "the curriculum components *may* [emphasis added] be combined" (Province of British Columbia, 2022c), as I noticed that much of the curriculum is written with a high degree of certainty. The GSPs were analysed separately as they are not written in sentence format. In what follows, each analysis is attended to separately.

5.2.1. Analysis of the Curriculum Overview, Introduction to Mathematics, and Goals and Rationale

The table below represents the results of the first analysis.

Table 5-1. Sentence-by-Sentence Analysis of Curriculum Pages

	Total number of sentences	Personal pronouns (I, you, we, our, us)	Number of sentences that animate the inanimate	Passive voice	Number of sentences that animate the inanimate and are written in the passive voice	Number of sentences containing hedging words or hedged phrases
Curriculum Overview (not including collapsible term descriptions in Supporting Diverse Learners section)	134	we (4) x2 we as citizens x2 we as the authors our (5) x4 general x1 our staff TOTAL: 3	34	14	2	5
Introduction to Mathematics	61	our (2 general) us (4 general) TOTAL: 0	18	12	2	5
Goals & Rationale	12	0	4	3	1	1
Totals:	207	3	56	29	5	11

Almost half of the sentences in the three sections either contain instances of the Author animating the inanimate or include the use of the passive voice – both of which effectively remove any adults from the situation. This is problematic because, by using inanimate objects as the subject of a sentence, the Author is implying that education will improve automatically as a result of adopting the redesigned curriculum. Also, if there are no humans present, there is no one responsible or accountable for ensuring that these promises are actualised. For example, consider the following statement from the Introduction to Mathematics page:

The design of the Mathematics curriculum ensures that [students] are able to pursue their individual interests and passions while establishing a strong mathematical foundation. (Province of British Columbia, 2022c)

The design of a curriculum on its own cannot ensure anything – if students are able to pursue their individual interests and passions while establishing a strong mathematical foundation, it is because of their teachers and the amount of support available in the school. This is by no means an automatic benefit of adopting a redesigned curriculum. And again, there are no human adults in this statement. To be more accurate, it might

read as follows, which actually has nothing to do with the redesigned curriculum and is more related to good mathematics teaching in general:

To honour students' individuality and engage them in learning mathematics, teachers work hard to get to know their students' interests and incorporate these as much as possible into the mathematics learning experience, while at the same time trying to support students in developing a strong mathematical foundation.⁵

The analysis also confirmed that most of the sentences do not include hedging words or phrases. Looking at this through the lens of Love and Pimm's (1996) questions, we have the following:

"Who is (are) the author(s)?"

There is no language indicating who the author(s) might be.

"To what extent do they acknowledge their presence in the writing?"

They do not acknowledge their presence beyond a very minimal and general use of personal pronouns. The personal pronouns used by the Author are 'our' (seven times), 'we', and 'us' (four times each). In 12 of these 15 occurrences, the Ministry uses the pronoun to refer to a general 'we/us/our' – as humans in a society. The Author only uses the pronouns to refer to themselves or their staff in three sentences. This use of a common or royal 'we' also provides an answer to Love and Pimm's fourth question, as it functions to create an ideal reader – a public that agrees on what it means to be an educated citizen and on the claim that this should be the purpose of education. If someone does not agree with the claims made or the expectations listed, they are not part of the 'we'.

"What pronoun(s) do they use to refer to themselves and the reader?"

As mentioned above, they refer to themselves only a couple of times, and very generally – as "we" or "our staff". They do not refer to or address the reader at all. The lack of acknowledgment of an author and reader is a choice that was made by the Author, and

⁵ Throughout this dissertation, I offer alternatives to what is written in the curriculum. In this re-writing I am making clear my own values, such as naming the author, showing collegiality with and support of teachers, and using language that is clear. I have adopted these values through extensive work alongside teachers who are trying to implement this curriculum.

this choice has implications – one of which may be alienating the reader. Another implication of not referring to or addressing the reader is that it suggests that the teachers are all alike, joined in their effort to produce educated citizens, when in fact we know that teachers vary broadly in their values. Morgan and Halliday both talk about the significance of choice in their writing on text analysis. Morgan (1996) notes that each choice made by the author, “affects the ways the functions are fulfilled and the meanings that listeners or readers may construct from the utterance” (p. 3).

What if the Ministry had chosen differently? Below is a paragraph from the curriculum and my attempt at a revised version – one in which a human author is writing to real teachers and an intelligent, caring, and concerned general public.

In the Goals and Rationale section, the first paragraph reads:

The British Columbia Mathematics curriculum aims to ensure that citizens are numerate and have mathematical habits of mind. The curriculum develops skills and processes that citizens can use to critically analyze information and provides the fundamentals on which mathematical specialties and professional applications of mathematics are built. (Province of British Columbia, 2022f)

In both sentences, the Author has chosen to animate the inanimate – to have inanimate objects perform actions normally attributed to people. This paragraph is functioning to conceal both the Author and any humans who may be involved in or responsible for the listed actions. The audience is also obscured as it does not appear to be written with any specific reader in mind. It seems to have more of a persuasive tone, which I will discuss in Chapter 7.

What if instead it had been written like this:

One of the gifts we can give our students is *numeracy* – a strong sense of number and the ability to think mathematically, both in a math class and in the world (site some research here on the benefits of being numerate?). For this reason, the team at the Ministry is encouraging teachers – as one of the primary goals of the redesign – to support students in becoming numerate, which involves students developing both a strong foundation in number, and a set of skills and processes they can use to understand and critically analyze information. Our team has worked closely with mathematics teachers and the mathematics education research community (name the districts and some papers including links) to develop curricular competencies and content that can act as signposts for teachers to support them on this journey. This is why the

learning standards contain outcomes related to mental math, computational fluency, estimation, reasoning, etc. – these are all components of numeracy.

I have attempted to re-write the paragraph to acknowledge and honour human beings and their relationships. I have deliberately removed the word ‘citizen’, since it is a political (and colonial) term rather than a human or relational one. I have also tried to write in clear, warm language – to an actual/empirical reader, whether that be a teacher, administrator, parent, or anyone else who may choose to read it. I have removed any instances of objects performing actions, so that the reader can understand exactly who is doing what to whom. I have provided citations and links in case the reader would like to learn more about how the Ministry developed its rationale. I wanted to express respect for the reader and a camaraderie with the teacher.

5.2.2. Analysis of the GSPs

As mentioned above, the GSPs had to be analysed separately as they are not presented in sentence format. I discuss the results of this analysis in more detail in later chapters, but what is relevant here is that the word *teacher* (the reader) does not appear in these documents, nor is the teacher ever directly addressed. Instead, there are lists of expectations of students. Looking again at Love and Pimm’s questions, we have:

“Who is (are) the author(s)?”

There is no language in the GSPs to indicate who the author(s) might be.

“To what extent do they acknowledge their presence in the writing?”

They do not acknowledge their presence in any way.

“What pronoun(s) do they use to refer to themselves and the reader?”

They do not refer to themselves or the reader – only to “students”. This is another instance of the Author concealing themselves and obscuring the participants, therefore creating the image of an authoritative voice from ‘up there’, which aligns with how the teachers I interviewed perceive the Author. Further, the Author has chosen to present themselves as an authority figure that is not to be questioned, approached for support, or contacted for any reason. The curriculum pages do not contain any options to “contact us”. Perhaps the Author did not consider that their writing might require clarification, or

that there may be individual teachers who could have different interpretations that would need managing. Or that there is any sense in which it could be improved. This is part of how the GSPs function – to be fully intact, irreproachable, objective. An implication of this choice is teachers feeling disrespected, undervalued, and unsupported.

“What evidence is there for the nature of a presumed ‘ideal’ reader on the part of the Author as contrasted with any actual reader?”

There is ample evidence that the Author has assumed an ideal teacher-reader, including using terms and phrases that many teachers do not understand; for example, “model mathematics in contextualized experiences” or “algebraic relationships among quantities”, or even the word ‘numeracy’ (see Chapter 8 for more on this). The Ministry also lists goals, both related to mathematics and to the concept of the educated citizen, but does not explain how the expectations listed in the GSPs lead to the fulfillment of these goals. This assumes a reader who is either not interested in or does not have a right to the evidence supporting the redesign. This idea of a model teacher-reader connects with Popkewitz’ notion of the fabrication of human kinds. Popkewitz pushes Pimm and Love further by looking at the implications of the ideal reader. The Ministry has assumed some general category of teacher to whom they can address general instructions.

Writing with this ideal teacher reader in mind was another choice made by the Ministry. What if the Author had chosen differently? What if instead, the curriculum was written to a real teacher? One who has questions and concerns, one who may have been trained under a different curriculum, one who has too many needs and not enough support or resources in their class, one who has no prep time because there is no one available to cover sick teachers, one who cares mightily but cannot do this without some training and release time? Perhaps if the Ministry had been writing to *this* teacher, the curriculum would be more helpful – more collegial and less authoritative, more supportive.

5.3. Discussion

The differences between the language used in the GSPs and the other sections analysed point to the possibility that the curriculum is written for two (ideal) audiences,

and therefore two separate author/reader relationships exist. For example, consider the two sentences below – one from the GSPs, and the other from the Curriculum Overview:

Students are expected to be able to do the following: represent mathematical ideas in concrete, pictorial, and symbolic forms. (Province of British Columbia, 2022d, e)

British Columbia's redesigned curriculum honours the ways in which students think, learn, and grow, and prepares them for a successful lifetime of learning where ongoing change is constant. (Province of British Columbia, 2022a)

The first sentence clearly states an expectation of students, using language from the mathematics register, whereas the second sentence is more persuasive – the Ministry makes a claim that cannot be true, as a curriculum is an object, and therefore cannot honour anything. It seems reasonable to conclude that the GSPs are written for teachers, and the other sections are written to the public and to various stakeholders invested in this new vision for BC's education system. In the GSPs, the Author writes authoritatively but indirectly to the teacher using the passive voice. The Author lists expectations of students drawing from both the mathematics register and a collection of terms borrowed and repurposed for the redesign (for example, problem-solving, reasoning and analysing).

On the other hand, when addressing the public, the Author seems less directive and instead adopts a more persuasive tone. For example, consider the following paragraph from the Curriculum Overview:

To maintain high achievement, British Columbia must transform its education system to one that better engages students in their own learning and fosters the skills and competencies students will need to succeed. One focus for this transformation is a curriculum that enables and supports increasingly personalized learning, through quality teaching and learning, flexibility and choice, and high standards. (Province of British Columbia, 2022a)

Here, the Author makes a number of unsubstantiated claims to convince the audience that the redesigned curriculum is necessary to keep up with the change in the world. But again, the Author obscures themselves and with that, their responsibility. As previously discussed, a curriculum on its own cannot support personalised learning.

I attempt now to rewrite this in a way that acknowledges and is more supportive to teachers, and that more accurately reflects the reality of the school system and the needs of our students:

To maintain high achievement, British Columbia must transform its education system to one that better engages students in their own learning and fosters the skills and competencies students will need to succeed. One focus for this transformation involves rethinking our curriculum, but before this, the Ministry must prioritize creating the conditions necessary for it to be successful. To this end, the province is committing to smaller class sizes, guaranteed in-class support for students with complex academic or behavioural needs (regardless of whether they have a designation), more inservice and collaboration time for teachers, and a collection of free professional resources from which teachers can draw.

As mentioned in the literature review, Love and Pimm (1996) describe how a text's author, through the text, takes on a position of authority in the class and is at the same time not accountable to the student or teacher. The student and teacher are expected to assume a somewhat passive role in the interaction with the text. This analysis has revealed that the same can be said about the curriculum. It is a static text in the sense that the reader cannot interact with it or its Author, but still must follow it. The Author makes claims and sets goals and expectations but is not accountable to the teachers or other school/district staff, or the students and their families, essentially leaving the educational community and the public with no choice but to acquiesce.

Chapter 6. The Ideational

As Morgan (1996) demonstrates, it is through examining the ideational function that we can learn about the types of processes in a text, and the participants in these processes. In other words, we can consider the question, “Who is doing what to whom?”. Consider, for example, *The cat sat on the mat*. The statement relates the process (sitting), to the participant (the cat) by expressing that the cat is sitting *on* the mat. So, to answer the question of who is doing what to whom, *the cat* (who) is *sitting on* (is doing what) *the mat* (to whom). As was mentioned in the methodology section, I approached this on two levels.

6.1. Another look at the data

In re-analysing the data collected for the previous chapter, it became clear that the Author used literary constructions that conceal the participants. Among these are *animating the inanimate* (Herbel-Eisenmann, 2007) and the use of the passive voice. Below are some examples of these constructions in the curriculum.

Table 6-1. Animating the Inanimate

Inanimate object as subject (“Who...”)	Verb (“is doing what...”)	Who/what is being acted on (“to whom”)
...a curriculum that	enables and supports	increasingly personalized learning
British Columbia’s redesigned curriculum	honours	the ways in which students think, learn, and grow and
	prepares them for	a successful lifetime of learning where ongoing change is constant
Personalized learning	focuses on enhancing	student engagement in learning and
	giving students choices	more of a say in what and how they learn
The design of the Mathematics curriculum	ensures that	[students] are able to pursue their individual interests and passions while establishing a strong mathematical foundation

Inanimate object as subject (“Who...”)	Verb (“is doing what...”)	Who/what is being acted on (“to whom”)
The focus on flexible teaching and learning	enables teachers to	confidently choose the strategies, resources, and applications best suited to the needs of students in their local setting
The Mathematics curriculum	enables [students] to	apply this [mathematical] knowledge to a broad range of situations encountered in everyday life
All courses	take	a problem-solving approach
Classroom design combined with active participation strategies	will enhance	student learning,
	increase	achievement, and
	contribute to	the development of well-educated citizens.
Inanimate object as subject (“Who...”)	Verb (“is doing what...”)	Who/what is being acted on (“to whom”)
The British Columbia Mathematics curriculum	aims to ensure	that citizens are numerate and have mathematical habits of mind.
The curriculum	develops	skills and processes that citizens can use to critically analyze information and
	provides	the fundamentals on which mathematical specialties and professional applications of mathematics are built.

In looking at these instances of the Author animating the inanimate, it becomes clear that many of the participants in the curriculum are non-human actors – either inanimate objects or abstract concepts. In the above examples, we have a non-human actor taking the place of a human (presumably a teacher), who is implicitly expected to ensure that students reach these goals. If we replace these inanimate objects or constructs with, “The teacher”, or “The teacher is expected to”, or even, “The Ministry is expecting teachers to”, we get a much more accurate depiction of what is really going on, as obviously the objects/constructs cannot perform the stated actions.

The way it is written, it seems as though the curriculum – without the help of any living adult – is performing a number of actions that sound important and good: developing, providing, etc. Moreover, because the Author chose to use verbs like *develop*, *enable*,

and *provide*, rather than action verbs, none of these claims are measurable. This is one of the reasons I later classify these sections of the curriculum as persuasive text (see Chapter 7).

In many cases, the objects of the sentences also lack a human presence. For example, consider the following from the table above:

... a curriculum that enables and supports increasingly personalized learning

The curriculum develops skills and processes...

Classroom design combined with active participation strategies will increase achievement.

In all of these partial sentences, there is an inanimate object performing an action on an abstract concept. There are no humans here.

Here are some examples of the Ministry's use of the passive voice:

One focus for this transformation is a curriculum that enables and supports increasingly personalized learning, through quality teaching and learning, flexibility and choice, and high standards.

Teachers are encouraged to create courses, modules, thematic units or learning experiences that go beyond learning area borders to focus on students' needs and interests or local contexts.

An important goal in integrating Indigenous perspectives into curricula is to ensure that all learners have opportunities to understand and respect their own cultural heritage as well as that of others.

Within and across grades, there are multiple ways to combine learning standards to create lessons, units, and learning experiences, encouraging any and all approaches that support the growth and development of students' mathematical understanding and skills.

This is facilitated by condensing the learning standards, focusing on flexible teaching and learning within relevant situational contexts, and continuing to develop a strong foundation of mathematical understandings and skills...

In all courses, the focus is on real-life, relevant contexts for learning...

The Mathematics curriculum has been designed to develop deep mathematical understanding and fluency, logical reasoning, analytical thought, and creative thinking.

Students are expected to be able to do the following:

Students are expected to know the following

Again, almost all these examples are disguised expectations of teachers. The teacher is rarely mentioned and is never addressed, even though they are the main participants involved in creating a learning environment in which students can come to know and be able to carry out the standards and goals set for them. For example, because the statement, “Students are expected to know the following” is written in the passive voice, it obscures both the person who set this expectation and the person expected to ensure it is fulfilled.

Before closing this section, I would like to note that the Author does not always use these constructions. Recall the data from the previous chapter:

Table 6-2. Re-Presenting Data from Chapter 5

	Total number of sentences	Number of sentences that animate the inanimate	Number of sentences written in the passive voice	Number of sentences that animate the inanimate <i>and</i> are written in the passive voice
Curriculum Overview (not including collapsible term descriptions in Supporting Diverse Learners section)	134	34	14	2
Introduction to Mathematics	61	18	12	2
Goals & Rationale	12	4	3	1
Totals:	207	56	29	5

In more than half of the sentences in these sections, the Author does *not* use such constructions. They make claims about the world, our province, and our education system. They also describe features and details of the curriculum. It seems that the Ministry uses these constructions when people might otherwise need to be named, as in the examples above.

In summary, the Author is using complex literary constructions to conceal both itself and any other humans, while implicitly presenting a plethora of expectations of the teacher.

They have done this through language that replaces the ‘who’ and the ‘whom’ of “who is doing what to whom?” with objects or abstract concepts. As I will show in the next section, the Author has also constructed an ideal student – the problem-solving child and future educated citizen.

6.2. The Child – Two Fabrications

In this section, I will explore the notions of ‘the problem-solving child’ (Popkewitz, 2004) and ‘the educated citizen’ constructed (borrowed?) by the Ministry, and how these constructions function to simultaneously create an ‘other’. In the next section, I will look at how these fabrications align with the Ministry’s goal of flexibility, choice, and personalization.

In his discussion about the normalising power of curriculum, Popkewitz (2004) introduces two concepts that will be useful in this analysis. The first is that of the *human kind*.

I discuss one human kind here, the *child as a problem solver*, and another later, the *disadvantaged child*. I call them human kinds because they are not merely terms but embody particular types of individualities or determinate classifications that have distinct chronological, physiological, and psychological characteristics administered by the school. (p. 13)

The second concept is *fabrication*:

Fabrication directs attention to how linguistic categories and distinctions of educational research are both fictions and creators of “things”.[...] Educational research and pedagogy are fields whose categories and distinctions produce fabrications of human kinds. [...] In this way the child as “problem solver” can be understood as a fabrication. The term is a fictional category invented to aid thought about matters of schooling deemed important for teaching and learning. (pp. 13–14)

In the BC curriculum, the Ministry presents us with two fabricated human kinds – the educated citizen and the problem-solving child. Although these fabrications are created and portrayed in a positive light – to prepare the child for “a successful lifetime of learning where ongoing change is constant” (Province of British Columbia, 2022a), and to contribute to society, which the Ministry claims, “requires well-educated citizens who are able to think critically and creatively and adapt to change” – they also create a dichotomy of normal and abnormal, therefore perpetuating a system that includes and

excludes students depending on their ability/willingness to participate in these fabrications. Moreover, both fabrications are based on Western ideology. I explore these fabrications and the Ministry's use of them below.

6.2.1. The Educated Citizen

In the section describing the educated citizen, the Ministry shares the following criteria, noting that this is what it values for all students in the system:

British Columbia's schools assist in developing citizens who:

- Are thoughtful and able to learn and to think critically, and can communicate information from a broad knowledge base
- Are creative, flexible, and self-motivated and have a positive self-image
- Are capable of making independent decisions
- Are skilled and able to contribute to society generally, including the world of work
- Are productive, gain satisfaction through achievement, and strive for physical well-being
- Are co-operative, principled, and respectful of others regardless of differences
- Are aware of the rights of the individual and are prepared to exercise the responsibilities of the individual within the family, the community, Canada, and the world

Although some of these points are related to academics, many are more about the interior disposition of the child – who the child should become – including what they should value. I discuss this more later in the chapter. Another interesting thing to notice about this conception of the educated citizen is that in the Curriculum Overview, the Ministry states that, “the voice of Indigenous people [must] be heard in all aspects of the education system” (p. 5). I'm not sure that this conceptualisation of an educated citizen honours their commitment. First, the term, 'citizen', refers to allegiance to the queen, which is a Western construct. Second, this characterisation seems more aligned with the traditional Western notion of knowledge and education, which is about rational thought and reasoning. Providing some contrast might help to show this more clearly. Consider the concept of holism, as described below by Jo-ann Archibald (2008):

An Indigenous philosophical concept of holism refers to the interrelatedness between the intellectual, spiritual (metaphysical values and beliefs and the Creator), emotional, and physical (body and behaviour/action) realms to form a whole healthy person. The development of holism extends to and is mutually influenced by one's family, community, band, and nation. The image of a circle is used by many First Nations peoples to symbolize wholeness, completeness, and ultimately wellness.

The never-ending circle also forms concentric circles to show both the synergistic influence of and our responsibility toward the generations of ancestors, the generations of today, and the generations yet to come. (p. 11)

Perhaps having holism as a core principle or even a core competency in the BC curriculum would contribute to a more balanced view of education in our province, one that is less focused on the development of the self and the rational mind, and more focused on community, responsibility, and the well-being of the child. What if we used this notion of holism to guide our definition of an 'educated citizen'? What might the mathematics curriculum look like then?

As outlined in the literature review, Popkewitz, Walkerdine, Snaza, and Wagamese have all cautioned against the overemphasis of the rational mind, and instead suggested more balanced ways of knowing and being. I wonder if redefining what it means to be an 'educated citizen' is the first true step towards helping students develop their whole self, while at the same time acknowledging and respecting Indigenous views and perspectives.

6.2.2. The Problem-Solving Child

Although Popkewitz (2004) often refers to the fabrication of the problem-solving child, it is not clear (at least to me) what exactly characterizes this problem-solving child. In other words, how do we recognize or define a problem-solving child? According to NCTM (2000), problem solving means, "engaging in a task for which the solution method is not known in advance" (p. 52). They add that, "By learning problem-solving in mathematics, students should acquire ways of thinking, habits of persistence and curiosity, and confidence in unfamiliar situations that will serve them well outside the mathematics classroom" (p. 53). Characteristics of "good" or "effective" problem solvers are listed throughout the book. Some examples are:

Good problem solvers tend naturally to analyze situations carefully in mathematical terms and to pose problems based on situations they see. (p. 53)

Effective problem solvers constantly monitor and adjust what they are doing. They make sure they understand the problem. [...] Effective problem solvers plan frequently. They periodically take stock of their progress to see whether they seem to be on the right track. If they decide they are not making progress, they

stop to consider alternatives and do not hesitate to take a completely different approach. (p. 54)

A problem-solving disposition includes the confidence and willingness to take on new and difficult tasks. Successful problem solvers are resourceful, seeking out information to help solve problems and making effective use of what they know. Their knowledge of strategies gives them options. If the first approach to a problem fails, they can consider a second or a third. (p. 334)

As the Ministry also draws from the NCTM for their problem-solving model, I will use the NCTM's definition and characterisations along with those put forward by the Ministry to summarize the qualities of a problem-solving child as follows:

A problem-solving child is one who confidently engages in tasks for which the solution method is not known in advance. This child has a strong mathematical foundation and is able to transfer mathematical knowledge to situational contexts. The child is curious, perseverant, resourceful and can quickly shift strategies or solution methods when necessary. The problem-solving child also works to understand other people's solution attempts through respectful communication. A problem-solving child thinks carefully, works to understand the problem, and reflects on their answer/solution to see if it is reasonable with respect to the original problem.

It is interesting to note that, as in the description of the educated citizen, many of these qualities are not explicitly about academics/mathematics; rather, they are about the inner qualities of the child. We turn to this discussion now.

6.2.3. The Alchemy

Popkewitz (2004) talks about how curriculum reform is often less about academic disciplines and more about normalising the child to become a productive future citizen.

There is a magical change as mathematics, science, and social sciences move from their disciplinary spaces into the classroom. The educational and social psychologies have little or nothing to do with understanding disciplinary practices. They are intellectual inventions for normalizing and governing the child's conduct, relationships, and communications. (p. 3)

This is evident in the description of the problem-solving child above, as well as in the Curriculum Overview, the Introduction to Mathematics and the Goals and Rationale sections of the curriculum.

Recall the Ministry's description of the educated citizen from the Curriculum Overview:

British Columbia's schools assist in developing citizens who:

- Are thoughtful and able to learn and to think critically, and can communicate information from a broad knowledge base
- Are creative, flexible, and self-motivated and have a positive self-image
- Are capable of making independent decisions
- Are skilled and able to contribute to society generally, including the world of work
- Are productive, gain satisfaction through achievement, and strive for physical well-being
- Are co-operative, principled, and respectful of others regardless of differences
- Are aware of the rights of the individual and are prepared to exercise the responsibilities of the individual within the family, the community, Canada, and the world

Developing citizens who are self-motivated and productive, who gain satisfaction through achievement, or who have a positive self-image is not about academics. Rather, it is about conditioning the child to become a willing and productive participant in a Western capitalist society.

As mentioned above, this alchemy can also be found in the Introduction to Mathematics section, especially concerning the phrase *mathematical habits of mind* – which appears six times in this section (and again in the Goals and Rationale section). Cuoco et al. (2010) use the phrase 'mathematical habits of mind', to describe ways of thinking that are "indigenous to mathematics", and offer the following list of what they call general mathematical habits of mind: performing thought experiments; finding, articulating, and explaining patterns; creating and using representations; generalizing from examples; articulating generality in precise language; and expecting mathematics to make sense. Interestingly, none of these are mentioned in the curriculum.

In fact, the phrase *mathematical habit of mind* is not defined at all. Rather, the Ministry refers to the benefits of developing these habits, what is required to do so, and the qualities of those who have adopted them. For example, "Mathematical habits of mind help us see the math in the world around us and help to generate confidence in our ability to solve everyday problems without doubt or fear of math" (Province of British Columbia, 2022c). Consider the following excerpt from the Introduction:

Mathematical habits of mind

Extensive research indicates that for students to develop mathematical habits of mind they must encounter and interact in intentional learning settings. Classroom design combined with active participation strategies will enhance student learning, increase achievement, and contribute to the development of well-educated citizens.

Students who have developed mathematical habits of mind exhibit expertise in:

- persevering and using mathematics to solve problems in everyday life
- recognizing that there are multiple ways to solve a problem
- demonstrating respect for diversity in approaches to solving problems
- choosing and using appropriate strategies and tools
- pursuing accuracy in problem solving

Figure 6.1. Mathematical Habits of Mind According to the Ministry of Education
Retrieved from: <https://curriculum.gov.bc.ca/curriculum/mathematics/introduction>

The first paragraph does not tell us anything about mathematical habits of mind, as phrases like “intentional learning settings”, and “classroom design combined with active participation strategies” are very difficult to conceptualise. These might sound nice, but upon closer examination, what do they actually mean? Moreover, this is also another case of the Author ‘animating the inanimate’, as classroom design and active participation strategies obviously cannot enhance student learning, increase achievement, or contribute to the development of well-educated citizens – it is the teacher and students working together who will do these things.

Regarding the bulleted list, again, none of these are specifically mathematical, nor are they related to the habits of mind listed by Cuoco et al. (2010). Rather, these are general habits that the Ministry deems useful for the educated citizen. There has been a shift here from mathematical habits to habits of a good citizen – just as Popkewitz describes.

In the Goals and Rationale section, the Ministry writes:

The B.C. Mathematics curriculum contributes to students’ development as educated citizens through the achievement of the following goals. Students are expected to:

- develop a deep understanding of both factual (Content) and processed-based (Curricular Competencies) information, needed to solve complex problems
- reason mathematically, using their understanding of number, pattern, and spatial relationships and analyzing data in order to solve problems
- become financially literate, which supports and underpins sound financial decision making
- use flexible, effective, and personalized strategies to analyze and solve increasingly complex problems in situational contexts
- explore the connections between mathematics and other ways of knowing, such as First Peoples knowledge and other worldviews

- develop the perseverance and confidence to apply mathematical thinking in various abstract and concrete contexts
- view and navigate their world with a mathematical perspective
- develop a capacity for abstract thinking, which includes the critical thinking skills necessary for understanding global issues in society

The first four of these goals are explicitly about mathematics, whereas the connection that the remaining four goals have with mathematics is not so clear; the first of these seems more about historical and cultural elements of mathematics, the next two are about the interior disposition of the child, and the last, well – is it not true that most humans are born with a capacity for abstract thinking? I think what the Author meant is that the goal is to help students develop their *potential* for abstract thinking, but this should be a goal of education in general – it is not specific to mathematics.

6.2.4. The Other

The Ministry frequently makes references to ‘problem solving’ and ‘problem’ throughout the mathematics curriculum. In most cases, these statements either involve stating the importance of problem solving in the curriculum or describing what students should be able to do with respect to problem solving. The Ministry clearly values problem solving and, as such, has created the fabricated human kind called the problem-solving child, as defined above. One consequence of this construction is that it simultaneously creates a category of other – the child who does not possess these qualities. What shall a teacher do with these children?

Popkewitz (2004) warns that, “these various inscription devices of pedagogy embody principles that normalize and divide and thus embody practices of social inclusion and exclusion” (p. 5).

Our argument is that the very pedagogical practices that include also exclude as different human kinds are produced. When the phrases all children will learn and no child left behind are evoked, that evocation is of universal norms and values whose principles of action and participation locate the ‘other’ child who is placed outside of the grid of normalcy. (Popkewitz and Lindblad, 2004. pp. 230–231)

Yolcu and Popkewitz (2018) note that the consequence of this universal goal is that, “those who are ‘different’ than the desired mathematically able bodies are pathologized

and they become both objects of governing and sites for intervention because they lie outside the moral qualities of a reasonable life” (p. 253).

Through these three sections, the Ministry articulates a very specific type of child. It dictates what students are supposed to know and be able to do, and who they are to become. In the words of Yolcu and Popkewitz (2018):

When closely examined, mathematics education that aims to prepare children for life is not merely for learning mathematics. The principles generalized in the curriculum actualize desired ‘bodies’ for the future. (p. 251).

6.3. Personalized Learning

In the previous section, I said that I wanted to address how these fabrications align with the Ministry’s goal of flexibility, choice, and personalization. In the Curriculum Overview, the Ministry states that, “One focus for this transformation is a curriculum that enables and supports increasingly personalized learning, through quality teaching and learning, flexibility and choice, and high standards”.

How do we reconcile the Ministry’s stated goal of personalized learning, with so many pre-determined goals for the student – both mathematical and not? The Ministry has created three separate lists of expectations for students: in the Curriculum Overview, the Goals and Rationale section, and the Introduction to Mathematics section. Moreover, teachers are responsible for reporting out on the grade-level learning standards for each student and these are not personalized. In theory, yes, there is some flexibility and choice in the sense that teachers can mix and match learning standards to “create lessons, units, and learning experiences”, but are they to do this to match each student’s interests at the time? Apparently so, as the Ministry defines personalized learning as follows:

Personalized learning is student-centred education tailored to individual needs. It is responsive to the passions and interests of teachers and students. In personalized learning, the methods, approaches, and learning environments address the interests, learning needs, and aspirations of learners. (Province of British Columbia, 2022b)

To add some perspective, I will now turn to a more general discussion about the phrase *personalised learning* – how it has been used, how it has been critiqued in the context of

21st century learning initiatives, and how it was intended to be realised in the redesigned curriculum.

6.3.1. What is Personalized Learning?

This is a difficult term to describe or understand, as it is defined and used in so many ways. According to Wikipedia (2022), “personal learning is an evolving term and doesn't have any widely accepted definition” (“Personalized Learning”). Moreover, the term is often associated with technology, as in a technology-facilitated personal learning environment. This is discussed in more detail in the next section. It is important to note though, that if the term is taken from one context and used in another, it becomes unclear as to what definition is intended by the Author.

6.3.2. Personalized Learning in the 21st Century

As discussed in the literature review, both Ehrcke (2013) and Sen (2016) caution that this new goal of ‘personalisation’ might not be about meeting the needs of individual students but could instead be a tactic of corporations to expand their market share to schools. *Personalised* in this context, means students working alone with a technology that has a customised a learning pathway for the student. Ehrcke (2013) explains:

What does technology facilitated personalization look like? It is perhaps better described using the term ‘adaptive learning’, as it typically consists of a computer program which offers adapted learning pathways based on the student’s test outcomes. Students begin with a test or assessment and the computer then develops a pathway of lessons and future tests according to the student’s current abilities. More sophisticated models will also include different potential outcomes that the student may want to pursue. (p. 73)

This is a very different meaning than that provided by the Ministry. If the Ministry is not using the term in this way, then it is really not saying anything new as good teachers always try to personalize instruction and provide choice to their students. The challenge is that personalizing instruction is only possible when the teacher is provided with the necessary time and resources, which is often not the case. Ehrcke (2013) writes:

The myth of personalization is used to make the 21st Century Learning model attractive to parents and children. What could be better than a school system designed to accommodate every child’s unique needs? Yet that

level of personalization would take many resources and would not necessarily involve any technology. It would require smaller classes, more teachers and a greater range of educational programs in all schools. Adaptive technologies are not personalized learning. (p. 74)

6.3.3. Personalized Learning in the Redesigned Curriculum

In 2011, the Ministry formed the *Curriculum and Assessment Framework Advisory Group* to “provide advice on directions for curriculum and assessment in the province” (Province of British Columbia, 2012). The group, according to the Ministry (2012) “comprised individuals from several partner groups and academic institutions”. One of the guidelines provided by the advisory group is that:

Support materials should be developed to support curriculum implementation. Curriculum resource materials developed in the field or by the Province should provide guidance for learning that is student-initiated, self-directed, inquiry-based, and interdisciplinary. (p. 3)

The Ministry, through the work with this advisory group, came to some of its own conclusions, one of which I think is important to discuss here.

Going forward, the task for the Ministry as it develops new curriculum and assessment guidelines is to remove barriers to personalizing instruction so that the curriculum is optimally manageable for teachers and allows them more freedom to find approaches that work for schools and students alike. (p. 2)

At the time of writing (six years after the redesigned curriculum was mandated for teachers), these support materials have not been developed, and the Ministry has not removed barriers to personalizing instruction.

6.4. Discussion

Through performing this analysis, I learned that the participants of this curriculum are obscured. The mathematics curriculum is saturated with the use of the passive voice and with complex abstract sentences that lack human presence. In Herbel-Eisenmann’s (2007) words, “The text created an image of the author as being absent. There was no “voice of the author” present, only someone omniscient who dictated what was to be done” (p. 358). What was clear regarding the participants was that the Ministry had an

ideal student in mind – the problem-solving child – and the curriculum was written for and about that child.

Statements about expectations of students such as: *Students are expected to know/be able to/develop/reason/become/use/explore/view/navigate* – are particularly troubling, as they do not account for the fact that not all students will be able to meet these requirements – not all students fit this fabrication. There is no mention in the curriculum of *what if not?* Expectations like these divide the population into those who can and those who cannot. As mentioned above, creating a human kind known as a *problem-solving child* or a *lifelong learner* (Popkewitz & Lindblad, 2004), simultaneously creates those who do not fit these human kinds.

Finally, this analysis has revealed that personalised learning means different things depending on who is using the term. Because personalized learning – as defined by the Ministry – requires a wealth of resources and support for teachers that have not yet been provided, I am left wondering how committed the Ministry actually is to this goal.

Chapter 7. The Textual

In earlier chapters, I talked about what a text is, according to Halliday, but what *makes* a text a text, as opposed to a non-text? At the very minimum, for something to qualify as a text, it should make sense and have some internal consistency. This is the concept of *coherence* that I discussed in Chapter 2. As a reminder to the reader, Halliday and Hasan (1989) noted that, “A text is characterised by coherence: it hangs together” (p. 48). The textual metafunction is the set of linguistic resources from which we draw to create such text. It is, according to Halliday and Hasan (2013):

the text-forming component in the linguistic system. This comprises the resources that language has for creating text, in the same sense in which we have been using the term all along: for being operationally relevant, and cohering within itself and with the context of situation. (p. 27)

Cohesion (also discussed in Chapter 2) is a subset of these resources that contributes to coherence. Halliday and Hasan (1989) introduced cohesion as, “the set of linguistic resources that every language has (as part of the textual metafunction) for linking one part of a text to another” (p. 48). So, cohesion is about semantic links between parts of a text, and it is these links (among other things) that create coherence.

Another important concept related to coherence is *intertextuality*, which according to Halliday and Hasan (1989), refers to the way most text relies on the assumption that the audience brings with it an understanding of previous related texts: “Part of the environment for any text is a set of previous texts, texts that are taken for granted as shared among those taking part” (p. 47). So maybe we could think of cohesion as coherence *within* a text, and intertextuality as coherence *across* texts.

Finally, Halliday and Hasan (1976/2013) note that one other condition needs to be met for a text to be coherent:

Texture involves more than the presence of semantic relations of the kind we refer to as cohesive, the dependence of one element on another for its interpretation. It involves also some degree of coherence in the actual meanings expressed: not only, or even mainly in the CONTENT, but in the TOTAL selection from the semantic resources of the language, including the various interpersonal (social-expressive-conative) components – the moods, modalities, intensities, and other forms of the speaker’s intrusion into the speech situation. (p. 23)

In the following analysis, I will consider each of these concepts – coherence, cohesion, and intertextuality – as information about these will likely reveal the degree to which the BC mathematics curriculum ‘hangs together’. I will do this following Morgan’s (1996) method for analysing the textual metafunction which she describes as follows:

In this section, the way in which the text is constructed as a coherent, meaningful unity is considered: what sort of text is it? This may be addressed by examining internal features which contribute to the way in which the text is constructed as well as the overall structure of the text as a whole. (p. 7)

7.1. Overall Structure – What Sort of Text Is It?

In Chapter 5, I concluded that the BC curriculum appears to have two audiences – the GSPs are written for teachers, and the other sections are written for the public and various stakeholders invested in this new vision for BC’s education system. Because of this, and because the GSPs are written in such a different way from the other sections, for the purposes of this analysis I will consider these as two distinct texts. I will refer to the text consisting of the Curriculum Overview, the Introduction to Mathematics, and the Goals and Rationale sections as Text 1, and the GSPs as Text 2.

Before even conducting the analysis outlined in Chapter 5, I noticed a major difference between Texts 1 and 2; namely, that Text 1 has a very different language style than Text 2. In Text 1, the Author seems to be promoting the redesigned curriculum – the language has a persuasive style, whereas Text 2 seems more directive – the Author is stating what students should know and be able to do. To investigate this further, I re-read Text 1 trying to identify what it was about the text that made it seem ‘persuasive’.

I decided that a persuasive sentence was one that contained unhedged statements that are not obvious and cannot be easily verified. For example, consider the following sentence from the Goals and Rationale section: “The British Columbia Mathematics curriculum aims to ensure that citizens are numerate and have mathematical habits of mind”. Or this sentence from the Curriculum Overview: “The focus on personalization and the flexible structure of the curriculum support the configuration of combined grade classrooms”. The truth value of these sentences cannot be confirmed and are not obvious. I accepted this as my criteria and proceeded to analyse Text 1 sentence by sentence as shown in Table 7-1.

Table 7-1. Sentence-by-Sentence Analysis of Curriculum Pages

Section	Total number of sentences	Number of sentences containing statements that are either obvious or can be easily verified	Number of sentences containing unhedged statements that are not obvious and cannot be easily verified	Number of sentences containing hedging words or hedged phrases	Number of sentences that state expectations of teachers or students
Curriculum Overview	108	33	67	5	5
Introduction to Mathematics	61	23	35	5	1
Mathematics Goals and Rationale	12	1	10	1	1
TOTALS	181	57	112	11	7

As shown in the table, 112 of the 181 sentences in Text 1 have a persuasive style as defined by my previous criteria. This is 62% of the text. I therefore conclude that Text 1 is a persuasive text.

Text 2 is vastly different than Text 1, in terms of structure, content, and style. It is more directive and less persuasive – simply stating what students should know and be able to do. Also, it is not written in sentence format. Instead, it is a series of bulleted lists separated into different sections. This bulleted list format creates issues regarding the cohesion and therefore texture, of the text.

7.2. Internal Features of the GSPs: Cohesion

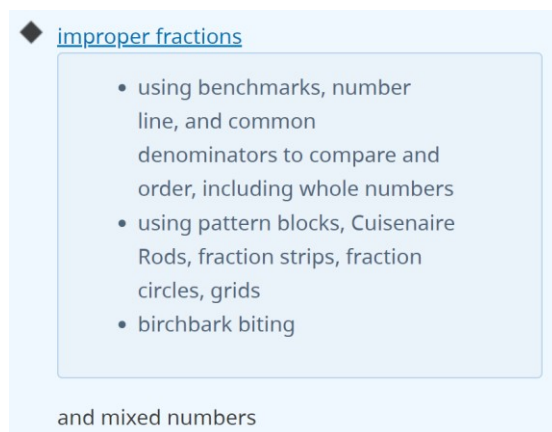
As mentioned in Chapter 2, Halliday and Hasan (1989) noted that the most important cohesive device to consider in any analysis of texture is the *cohesive tie*. To remind the reader, a cohesive tie is a relation – a semantic link between two spatially separated parts of a message. In other words, “the two terms of any tie are tied together through some meaning relation” (p. 73). In this section, I analyse the level of cohesion in the GSPs by considering the amount and nature of cohesive ties in the document.

The GSPs have three main sections – Big Ideas, Curricular Competencies, and Content – the last two of which make up the learning standards. Although an analysis could be done of the cohesion between the big ideas and the learning standards, my concern here is with the learning standards themselves, so for this analysis I will be looking at cohesion in the learning standards. Specifically, I will explore the cohesion between the learning standards and corresponding elaborations. To give some background on the elaborations, here is how they are described in the Introduction to Mathematics:

The elaborations take the form of explanations, definitions, and clarifications. They provide additional information and support for both teachers and students and can serve as potential places to begin teaching and learning. (Province of British Columbia, 2022b)

Although most of the learning standards have corresponding elaborations, these elaborations often do not provide adequate clarification as I will show in this section. This came up several times in my interviews and is also often cited among teachers I work with as a significant barrier to operationalizing the redesigned mathematics curriculum. Looking at this issue from the perspective of cohesion provides some hints as to where the difficulty lies. Consider the following example from the content section of the Grade 6 GSP for example:

Students are expected to know the following:



◆ [improper fractions](#)

- using benchmarks, number line, and common denominators to compare and order, including whole numbers
- using pattern blocks, Cuisenaire Rods, fraction strips, fraction circles, grids
- birchbark biting

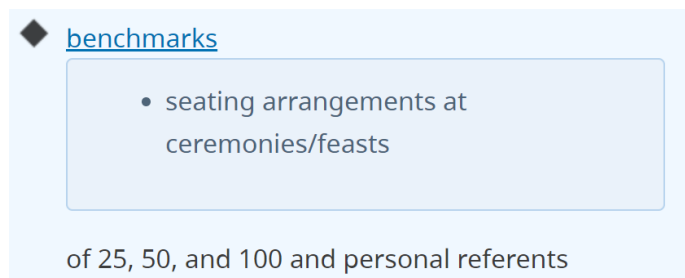
and mixed numbers

The first elaboration is clear and helpful. It explains that students will use certain tools to compare and order fractions and mixed numbers. Interpreting the next two elaborations, however, is not so straightforward. In the second one, there is a list of manipulatives but no explanation regarding what to use them for. There is no semantic connection

between the elaboration and the learning standard. The Author does not explain how using these manipulatives contributes to “knowing” improper fractions and mixed numbers. That said, I can at least *imagine* how I could use these tools to help students investigate concepts related to improper fractions and mixed numbers. The third elaboration is even more problematic, as the connection between improper fractions/mixed numbers and birchbark biting is not at all obvious and it is not explained.

Birchbark biting is also offered as an elaboration in two other content standards for Grade 6 – multiplication and division of decimals, and area. If birchbark biting is a cultural practice that holds within it enough mathematical richness to be an elaboration for three different content standards, why did the Author not take the time to explain it somewhere? The teachers are left to try to interpret this on their own. And this is just one example. This is a common feature of the learning standards. Here is an example from Grade 2:

Students are expected to know the following:



The screenshot shows a light blue background with a dark blue diamond icon on the left. To the right of the icon is the word "benchmarks" in blue text. Below this, there is a rounded rectangular box containing a bulleted list item: "• seating arrangements at ceremonies/feasts". Below the box, the text "of 25, 50, and 100 and personal referents" is visible.

The elaboration does not contain any information about what a benchmark is, or about what exactly students are supposed to know about benchmarks. Instead, there is a reference to seating arrangements with no semantic link to the learning standard.

Finally, I will provide an example from the curricular competencies – this learning standard is in Grades 2 and 6, but only has an elaboration in the Grade 2 GSP:

Students are expected to be able to do the following:

◆ Represent mathematical ideas in [concrete, pictorial, and symbolic forms](#)

- Use local materials gathered outside for concrete and pictorial representations.

Being able to represent mathematical ideas in concrete, pictorial, and symbolic forms is a foundational component of learning mathematics, yet this elaboration gives no information about what it means for children to represent mathematical ideas in these ways. It does not offer a definition, explanation, or example that might be helpful for the teacher. Again, there is no semantic link – no connection in meaning – between the learning standard and the elaboration.

Although this section is an analysis of cohesive ties in the GSPs, there are also instances of missing or unclear cohesive ties in Text 1 – words that do not cohere with other words in sentences. I will not go into a thorough analysis of this, as my main concern with cohesion in the GSPs, but I will offer the following example from the Introduction to Mathematics section:

Within and across grades, there are multiple ways to combine learning standards to create lessons, units, and learning experiences, encouraging any and all approaches that support the growth and development of students' mathematical understandings and skills.

If we consider this as two parts of a message, it looks like this:

Part 1:

Within and across grades, there are multiple ways to combine learning standards to create lessons, units, and learning experiences

Part 2:

encouraging any and all approaches that support the growth and development of students' mathematical understandings and skills.

There is no cohesive tie between these messages. The word 'encouraging' does not cohere with any subject in Message 1. Who is encouraging whom? So 'encouraging' is not an adequate semantic link between the two messages. This sentence therefore lacks texture and as a result, does not 'hang together' nicely. This lack of texture also

creates confusion for the reader as the actual meaning of the sentence is not clear. I will discuss this more in the next chapter. I turn now to a discussion about the intertextuality of the two texts.

7.3. Intertextuality

As I mentioned in the introduction to this chapter, intertextuality refers to how understanding a text requires knowledge of surrounding texts. According to Wikipedia (2022),

Intertextuality concerns the factors which make the utilization of one text dependent upon knowledge of one or more previously encountered text. If a text receiver does not have prior knowledge of a relevant text, communication may break down because the understanding of the current text is obscured. (“Text Linguistics”)

In this section, I look at the intertextuality between Text 1 and Text 2, and between the texts and the broader context of mathematics education.

7.3.1. Intertextuality Across the Texts

In the curriculum pages that I analysed, Text 1 is the “previous text” that the Ministry might assume is understood by the reader of Text 2. Text 1 is where the overall design and structure of the curriculum are explained, along with many of the terms used. The problem is that there are intertextual inconsistencies between the two texts. Below are a few examples.

Table 7-2. Examples of Intertextual Inconsistencies

Statement from Curriculum Overview (from Text 1)	Inconsistency with GSPs (Text 2)
Personalized learning focuses on enhancing student engagement in learning and giving students choices — more of a say in what and how they learn.	Learning standards are universal and non-negotiable – students do not have a say in what or how they learn.
Classes of students of more than one grade provide opportunities for teachers to develop a mindset that sees all the students as a group of learners with a range of needs and interests. Multi-grade programs should find a comfortable fit with the curriculum.	Teachers are required to report out on the learning standards for each grade, even in a multi-grade classroom. Most teachers already try to see all students as a group of learners with a range of needs and interests. A multi-grade class does not offer more opportunity to do this. If anything, it reduces the opportunity as the teachers is required to assess both groups separately.
British Columbia’s education transformation therefore incorporates the Indigenous voice and perspective by having Indigenous expertise at all levels, ensuring that Indigenous content is a part of the learning journey for all students, and ensuring that the best information guides the work.	Teachers have expressed frustration in a lack of support and of said expertise and ‘best information’ in this area. Rather than being “part of the learning journey”, the Indigenous content is listed as a noun or two in the elaborations and is always the last elaboration on the list (for the competencies as well). Moreover, how it connects to the learning standard is never explained.

I would like to note here that the Ministry made a choice always to place the elaborations containing Indigenous examples/suggestions last. They could have chosen differently so why did they not?

It is apparent from the interviews that teachers do not regularly (if at all) look at or refer to Text 1. Rather, they plan their instruction and assessment from Text 2 (the GSPs), as it is this document that contains the learning standards. So, for a typical teacher, Text 2 *is* the curriculum. In the end, this might be better for teachers as there are so many intertextual inconsistencies between the two texts. The fact that these inconsistencies exist though, makes me wonder again how committed the Ministry is to their vision of a transformed education system.

7.3.2. Intertextuality More Broadly

There are several words and phrases in the curriculum that are used in ways that do not necessarily align with how these words/phrases have been used elsewhere in mathematics education. In other words, there is a lack of intertextual consistency

between the curriculum and the field. Two examples that I have discussed in Chapter 6 are *personalized learning* and *mathematical habits of mind*. I think this is important to highlight, as the Ministry's choice to use phrases that could have other interpretations – or to create other interpretations – is another factor that contributes to the lack of clarity of the curriculum.

7.4. Discussion (Overall Coherence)

This analysis has revealed that the BC mathematics curriculum lacks coherence, both within and between sections. The document – especially the GSPs – does not have enough texture to make it 'hang together' nicely. Perhaps this was intentional so teachers could textualize it how they choose, to allow for more choice and flexibility, but I am not sure teachers see it this way. The lack of coherence creates a corresponding lack of clarity in the document, which is the topic of the next chapter.

Chapter 8. On Clarity

In this penultimate chapter, I analyse the clarity of language in the BC mathematics curriculum; first, by analysing the clarity of some of the key terms; second, by examining the level of clarity in the learning standards. Finally, I analyse the results of the interview questions that were related to clarity.

8.1. Clarity of Terms

As mentioned in the Methodology chapter, to analyse clarity of terms in the curriculum, I followed an analysis conducted by Bergqvist and Bergqvist (2017). Here, once again, is the classification I used, following the authors of the study:

A word is seen as *defined*, *explained* and/or *exemplified* if the formal curriculum contains a definition, an explanation and/or an example, respectively. Whether a *description of the meaning of a word* is a *definition* or an *explanation* might be difficult to determine but for our analysis, it is not necessary to separate these, since either makes the text clearer. A concept is seen as *exemplified* if there is an example in the text. A concept is considered to be *characterized* if the text consists of a wording containing where the concept is the subject of a sentence or a subordinate clause, for example, 'Many problems can be solved in direct connection to concrete situations'... A word is seen as *unambiguous* if the definitions of the word in three central Swedish dictionaries coincide and no version of the dictionary definitions is contrary to the MCRF definition. If a single dictionary has more than one main (different) definition, the word is seen as ambiguous. (p. 159)

I summarize the results of the analysis in Table 8-1 below.

Table 8-1. Analysis of Clarity of Terms in the Redesigned Curriculum

	Curriculum Overview	Math Intro	Goals and Rationale	Grade 2 GSP	Grade 6 GSP	Unambiguous?
Reason/ing	0	7	2	2	3; 1 Explained	No
Model/ling (two uses)	8	5; 1 Example	0	2; 1 Explained	1 Explained	No
Problem	1	17	5	5	5	No
Visualise	0	1	0	1	1	Yes
Represent	2	12	0	6; 1 Example	5	No
Reflect	3	4	0	2; 1	2; 1	Yes

	Curriculum Overview	Math Intro	Goals and Rationale	Grade 2 GSP	Grade 6 GSP	Unambiguous?
				Explained	Explained	
Numeracy/numerate	7, 1 Definition	0	2	0	0	No
Know	7	3	1	1	1	No
Knowledge	10	7	1	3	2	No
Flexible/Flexibility	8	5	1	0	1	No
Fluency/fluent	0	2	1	3	2	No
Fraction of terms defined, explained, exemplified	1/8	1/10	0/7	3/9	3/10	2/11 un-ambiguous

The rows of the table show how many times each term occurs in the given section, and if it has been defined, explained, or exemplified; and the last column contains information regarding whether the term can be considered unambiguous based on the level of consistency across three dictionaries – the Oxford, Cambridge, and Collins, and with the definition provided in the curriculum.

Some of the terms have been explained to some degree, or examples have been given, but most of the key terms (e.g., problem, know, flexible, fluent) have not been defined, explained, or exemplified, and are ambiguous. Only two of the eleven terms can be described as unambiguous. To add to this lack of clarity, some terms (like *problem* or *model*) can be used in the context of mathematics (within the mathematics register) or more generally. This obscures the meanings even further. Anne Watson (2006) also points to this tendency of curriculum writers to use vague terms: “The language of the National Curriculum is at times very vague – such as asking that learners should ‘understand equivalent fractions’” (p. 33). She spends the next eleven pages exploring the potential meanings and interpretations of the word ‘understanding’.

As I noted in the methodology chapter, the fourth aspect considered by the authors – characterisation – is significantly more complex, and I have decided not to consider it in this analysis except to note, as I did earlier, about a few instances of phrases being characterised. In none of these cases, however, did the characterisation clarify the term. Rather, and this is consistent with what Bergqvist and Bergqvist (2017) found, “the

characterizations use verbs that describe what can be done with the concept or what the concept can do” (p. 162). For example, here is a characterisation from the Introduction to Mathematics section:

A problem-solving model provides students with the necessary skills to read a problem, choose from a variety of appropriate strategies, apply a strategy to solve the problem, and then reflect on the efficiency and accuracy of the strategy to explain the answer.

In this example, a problem-solving model is the subject of the sentence, and the Author describes what a problem-solving model can do, but not what it is. Nowhere in the curriculum is *problem* or *problem solving* or *problem-solving model* defined or explained. To offer one more example, *personalized learning* was characterised in three of the four of its occurrences, but was not defined, explained, or exemplified in any of these sections, and the characterisations did not provide clarification about its meaning. *Personalized learning* is defined in the glossary, but it is unlikely that teachers look at the glossary, especially when the main curriculum documents do not link back to it.

Of the eleven terms considered for this analysis, only five were defined, explained or exemplified, and only two of them are unambiguous. I conclude therefore, that the language that makes up the BC mathematics curriculum is not clear.

8.2. Clarity of Learning Standards

The next analysis I conducted was of the learning standards more generally. In terms of clarity, I noticed that the expectation statements related to the curricular competencies are different from the content expectations in many ways, but with respect to clarity, there are two significant differences. First, the words that link the expectation sentence to the expectation itself – “do” versus “know”. Second, the fact that the first word of every expectation in the competencies is a verb, whereas the first word/phrase from the content is a noun. These differences are shown in red in the following screenshot from the Grade 2 GSPs:

Curricular Competency

Elaborations +

Students are expected to be able to do the following:

Reasoning and analyzing

- ◆ Use reasoning to explore and make connections
- ◆ Estimate reasonably.
- ◆ Develop mental math strategies and abilities to make sense of quantities
- ◆ Use technology to explore mathematics
- ◆ Model mathematics in contextualized experiences

Understanding and solving

- ◆ Develop, demonstrate, and apply mathematical understanding through play, inquiry, and problem solving
- ◆ Visualize to explore mathematical concepts

Content

Elaborations +

Students are expected to know the following:

- ◆ number concepts to 100
- ◆ benchmarks of 25, 50, and 100 and personal referents
- ◆ addition and subtraction facts to 20 (introduction of computational strategies)
- ◆ addition and subtraction to 100
- ◆ repeating and increasing patterns
- ◆ change in quantity, using pictorial and symbolic representation
- ◆ symbolic representation of equality and inequality
- ◆ direct linear measurement, introducing standard metric units

Figure 8.1. Verbs Versus Nouns in the Grade 2 GSPs

Adapted from: <https://curriculum.gov.bc.ca/curriculum/mathematics/2/core>

Regarding the first difference – ‘to do’ versus ‘to know’ – this is important because a teacher can usually recognize or determine whether a student is doing something. I can measure and assess if my students are able to estimate reasonably, for example. The word *know* however, is harder to define and is therefore much more difficult to measure – especially when followed by a noun. For example, consider the following standard from Figure 8.1: “Students are expected to know benchmarks of 25, 50, and 100”. What does it mean to *know* benchmarks?

Concerning this combination of an ambiguous verb (to know) and nominalized process, the consequence is the obscuring of what exactly is expected of the student. Looking at another example, “Students are expected to know addition and subtraction to 100”, it is not clear what *to know* means in this context either. There is no stated expectation about the relationship between the student and the mathematical processes, making the statement open to the interpretation of the reader. A student “knowing” addition and subtraction could mean anything from understanding the meaning of these processes, but being unable to add and subtract at all, to being able to add and subtract fluently with a full conceptual understanding.

This ambiguity raises questions about assessment and what proficiency might look like regarding these content expectations, but I will not go into that here. If, however, the statement had been written without the use of nominalisation – “Students are expected

to be able to add and subtract to 100 using at least two strategies (e.g., adding from left to right, counting up or using the constant difference strategy to subtract)”, for example – the expectation would have been clearer.

Another issue that contributes to the lack of clarity in the learning standards is the lack of coherence, as mentioned in the previous chapter. If there is no semantic link between a learning standard and its elaboration(s), the reader will have difficulty seeing how the elaboration clarifies or is related to the learning standard. This issue came up several times during the interviews, which I turn to now.

8.3. What Do the Teachers Think?

During the interviews, I asked teachers four questions that were explicitly about clarity, two of which address the clarity of the learning standards:

1. What do you think the following curricular competencies mean?
 - a. Visualize to explore mathematical concepts
 - b. Use reasoning to explore and make connections
 - c. Model mathematics in contextualized experiences
2. What do you think the word numeracy means?
3. Is there any language in the math curriculum that you find unclear or that you don't understand?
4. What do you think is meant by personalized learning? In what ways do you personalize the curriculum for your students? How reasonable is this expectation on a practical level?

To give some background, for Question 1, the first competency has no elaboration in the curriculum, the second only has one for Grade 6, and for the third competency, there is an elaboration for *model*, but not for the competency as a whole. There was very little agreement among teachers about what these competencies mean. I will not describe their responses to all three competencies as I do not think it is necessary for the purpose of this analysis, but I will go into some detail about the modeling competency as that is where teachers had the most disagreement. Here are their responses:

Ca: Maybe it would be like using manipulatives? That's how I see it. So being able to use the blocks to show say like four plus six equals ten, like using the blocks and putting them together...

This teacher is talking about modeling using concrete materials, but did not address the second part of the competency involving contextualized experiences.

This next conversation comes from me interviewing two teachers who work together:

A: I would say using math in a real life setting so I'm at a store and something is 50% off... Or workplace math – measurement – something more practical and hands on – so when I think contextualized experience I think something that's more applied to real life situations where you're gonna use that math and a lot of kids ask that...

Interviewer: Okay, it says *model* so what do you think model means here?

C: Build a model? Draw a model.

A: I don't know *I was just thinking use and model would be the same thing* 'cos when you model something you're showing that you can do it right? [Italics mine]

These teachers are talking about contextualized experiences but not modeling, where the teacher who provided the previous response talked about using manipulatives to model a mathematics question, but did not refer to contextualized experiences. This is a common theme in the interviews – teachers addressing one of the two parts of this competency. Below are the remaining responses, along with a few of my comments. I grouped some of the responses that were similar.

T: Okay [laughs]. Well, modeling you know and contextualizing well in the context I mean there's so much lalalala like it could be said much clearer than that but to me it means in the context of what you're learning being able to show a model or a representation of it.

C: Oh ah, maybe it will be using manipulatives that's how I see it. So being able to use the blocks to show $4 + 6 = 10$ or even the Cuisenaire rods

So, according to these teacher's responses, they have not differentiated this competency from the one that states that students are expected to be able to, "Represent mathematical ideas in concrete, pictorial, and symbolic forms" (Province of British Columbia, 2022c). They do seem similar so I can understand the confusion. This next teacher understands the competency but is not sure how to actually carry it out:

M: That one I find is a lot harder to do. 'Cos contextualized experiences, I think that's more of a real-life situation and for them to model that, I have a hard time with that. So with integers again, maybe gains and

losses but like if I think back to Pythagoras I have a hard time with them modeling that um... we do like real life questions but I don't think they're modeling it.

The following three responses show an understanding of the 'real-life' component, although it seems the first teacher sees this as a connection the student has to make, where the other teachers understand this as being built in to the problem. Notice again that the second teacher did not mention modeling.

S: Make models from their life. Make a link from the problem to their own life

Ad: Most of the numeracy tasks that I give – the first term we did paper route – I got a lot of really good submissions so you have a contextualized experience where you have to make a decision that's best for you but you have parameters that you need to fit within... I like – if I can – to put the math in some kind of experience that they're going to have.

Al: Being able to connect their math concepts and model their mathematics concepts based off a real-world experience I think. I think it means seeing patterns at home or back to Minecraft recognizing that there was a more efficient way to build the rail system and it was a repeating pattern of powered and non-powered rails. And using this pattern was the most efficient way. So, they were able to contextualize that math in something they really care about.

These responses show that teachers interpret this competency in many ways. I wonder which of these if any, are consistent with the Ministry's intention.

For Question 2, I asked teachers what *numeracy* is. I only asked seven of the eight teachers, as I decided to include the question after having already conducted one of the interviews. All but one of the teachers thought that numeracy is about number and operations so there is some consistency in the responses, but that definition does not align with the Ministry definition of numeracy from the Curriculum Overview:

Numeracy is the ability to understand and apply mathematical concepts, processes, and skills to solve problems in a variety of contexts.

Only one teacher mentioned numeracy as being about using numbers in context. Here are the teachers' responses:

C: Numbers. I think it means numbers.

A: I think you talked about this in one of those meetings and now I forget! [laughing]. Just being able to understand and work with numbers.

T: Numeracy well for me it is understanding numbers being able to represent numbers and numeracy is big to me.

Interviewer: Are numeracy and math the same thing do you think?

T: Not necessarily, no because numeracy is just really understanding numbers and being able to represent them and manipulate them and play and decompose and you know all those things right? Whereas math isn't necessarily that, I mean it is but it's way more.

I interjected with the question of whether numeracy and mathematics are the same thing as this was the third participant in a row who had said numeracy is about numbers (without mentioning anything about context or 'real-life').

M: I think it means understanding numbers and how to use numbers. How to use numbers in their daily life.

This is the only teacher who mentioned using numbers in a real-world context. The remaining responses echo what has come before this:

S: Numbers, sequencing, ordering, comparing. Numeracy could be... I think it's a pretty vague thing numeracy. It could be adding, subtracting mentally.

Ad: [laughs]. Now you're going to get me stuck because am I going to get that mixed up with fluency? Numeracy to me is the ability to play with numbers or understand that numbers can be broken down, decomposed, and put back together in the way that we do with language and sentences.

Al: I think it's the number concepts. Like understanding the base 10 system and the different operations that we can apply and how we can manipulate those numbers. I don't know. I've never been asked those questions. But I guess yeah, being able to read numbers.

Numeracy is touted as being one of the major goals of the redesigned curriculum, but it seems as though teachers and the Ministry do not have a shared understanding of the meaning of the term. In fact, there is even inconsistency within the curriculum, as the definition provided in the glossary is different from the one in the Curriculum Overview:

Table 8-2. Two Ministry Definitions of Numeracy

Curriculum Overview	Glossary
Numeracy is the ability to understand and apply mathematical concepts, processes, and skills to solve problems in a variety of contexts.	Numeracy is the willingness and ability to interpret and apply mathematical understanding to solve problems in complex situations, and the perseverance to analyze and communicate these solutions in ways that are relevant to the given context.

Perhaps if this word was used even once in the GSPs – and hyperlinked to the definition – teachers would have a better understanding of how all the pieces fit together – that the whole purpose of the content and competencies is to help students develop numeracy. This is primarily an issue of intertextuality – where an understanding of previous or surrounding texts is assumed – even though teachers generally do not look at these surrounding texts.

The next question I asked related to clarity was, “Is there any language in the math curriculum that you find unclear or that you don’t understand?” Most teachers referred to the vagueness or lack of clarity around the curricular competencies, and how to appropriately incorporate Indigenous worldviews and perspectives. Here are a few of the responses (I did not include them all as it is more of the same). The symbol ‘//’ is to show one teacher interrupting the other.

A: Algebraic relationships among quantities //C: that’s getting up there// A: yeah that’s like can you dumb that down for me?

A: I think the inquiry you know... like expanding more on that would be //C: yeah that should probably have a little bit more explanation ‘cos I think everyone interprets that differently

A: I think too like having with the first peoples’ principles//C: I find that difficult unless you have somebody around to explain it to you, you know what I mean?

A: Or just have more examples. And I think mental math strategies – fluent and flexible... yeah see that one’s kind of vague.

This first set of responses comes from two teachers who work at the same school who I was interviewing together. They referred to things like ‘algebraic relationships among quantities’, ‘inquiry’, and ‘fluent and flexible’. This is all language pulled directly from the learning standards – from both the content and competencies. It is evident from their

responses that they did not find the language in these learning standards clear or self-explanatory. The next two teachers reported similar challenges:

T: I find that almost anything to do with First Peoples I find that challenging because I wish we had... I've gone to some of my Aboriginal liaison workers in the past and asked them for help with like seasonal stuff and like even what it says there about First Peoples use specific estimating, measurement techniques in daily life, like I don't know how to address some of that stuff. I wish I had more... I didn't find that I got the help – they didn't seem to know so I wish there was more clear information around First Peoples, and I'm talking everything, not just math. It needs to be way more - links to information or something that helps us to understand what they want us to teach.

M: I'm having a hard time with "apply mathematical understanding through play, inquiry and problem solving". It's that play word that's giving me a little bit of a catch. I don't know how to involve that into the classroom. Is that like card games? Is that something else? I'm not sure what that actually means.

Interviewer: Is there anything else in there that you don't know what it means?

M: I'm also having a hard time with incorporating First Peoples world views and perspectives to make connections to mathematical concepts. I do have that FNEESC resource⁶, but I don't really know how to bring it into the classroom well. Is it like a token type involvement, is it really meaningful? And when it says tools and technology to explore, does this mean a calculator or is it looking for like something on the computer. I see people using the online... is it a math program or just a calculator?

It is interesting that all of these teachers referred to the problematic nature of the recommendations around Indigenous content. They all would have really appreciated more support in that area.

The only teacher who was satisfied with the language in the mathematics curriculum was the one with a background in mathematics:

AI: In the math curriculum, no. My background is in mathematics and maybe that's why, but ask me about the language arts curriculum and

⁶ FNEESC is the acronym for First Nations Education Steering Committee, and this organization created a resource entitled, *Math First Peoples: Teacher Resource Guide*. One of the goals in the creation of this document was to support teachers in implementing the redesigned mathematics curriculum.

it would be a different story. But the math curriculum I feel confident in and it does do a good job in adding the hyperlinks and the elaborations.

And most elementary teachers are not math specialists so I will treat this as an exception. The other teachers found at least some of the language to be unclear. I also noticed that even though I did not explicitly ask about this, six of the eight teachers mentioned at some point during the interview that they struggle with the Indigenization component of the redesign. As it turns out, this is a major source of confusion for teachers. The learning standards that contain direction or suggestions about Indigenous perspectives are unclear on two levels – first, regarding the (lack of) semantic connection between the learning standard and the elaboration, as discussed in the previous chapter, and second, on how to respectfully enact the suggestions put forth by the Ministry, when no resources or in-service have been provided.

This finding aligns with what Gacoin (2018) found in his BCTF research report, that “the perspectives and experiences of team members directly contradict the Ministry’s claim that ‘Indigenous worldviews, perspectives and content have been *built into all* new and redesigned curricula (K-12)’ (BC Ministry of Education, 2018, emphasis added)” (p. 23).

There was a specific concern about the tokenistic nature of some of the content elaborations. One teacher shared:

I’m not incorporating the canoe journey question into my Pythagoras theorem right now. For that one, it doesn’t seem like a very authentic incorporation into the math lesson... It just seems like a token question.

Again, this is consistent with the findings from the BCTF research report. Gacoin (2018) writes: “Team members also raised substantial concerns with how they were able to engage in this work, and how ‘not to fall into the trap of tokenism’” (p. 21). Both Gacoin and Lamb note the importance of the government supporting this shift with resources and in-service – neither of which have been provided at the time of writing.

The last interview question related to clarity is about personalized learning:

What do you think is meant by personalized learning? In what ways do you personalize the curriculum for your students? How reasonable is this expectation on a practical level?

Here is the first response:

Ca: That's hard. I mean I try because I love to do centres so I find that's when I do the personalized teaching. The examples I use with the students I have in front of me is very different depending on the groups that I have. [I mentioned that this sounds like differentiation and that personalization might be more about students' interests/passion]. You can do it when you do a project. You can try this with whatever is your passion right now. But other than that no, it's too hard. But I do think it's important to know the interests of your students 'cos that can really help them get into projects or even when they're having a hard time, it can help them.

This teacher is basically saying that she does her best to differentiate instruction and to get to know her kids, but that personalizing instruction beyond that is not doable within the context of an actual classroom.

Here are the responses of the two teachers I interviewed together:

C: Do you know? (to A)

A: Well maybe just trying to cater to each child.

C: But you do that anyways.

A: Maybe they're just re-iterating it for you.

C: I feel like I do that anyways – I do that naturally

This is an interesting exchange because the teachers are expressing the banality of this concept as part of the redesign. They have noticed that there is nothing new here – teachers have always tried to meet the needs of individual students.

The next response indicates that this teacher understands the two different ways the phrase *personalized learning* can be interpreted.

T: Well [laughs] it could be about topics and subjects they're interested in like personalizing it that way. Sometimes I do like when I know that they're into sports I might refer to something like that. Um but it could also mean personalizing like if students are at different places in their ability levels like personalizing giving more challenge to kids up here and simplifying for kids down here right? So personalizing it can be two levels there I would say.

In the remainder of the responses, the teachers are mainly referring to personalized learning as differentiated instruction.

M: I think it means you're not necessarily teaching the same ideas and concepts to all the same students at all the same time. So personalized

learning or teaching is having the students learn what they need to learn on their own schedule

S: Teach to the students' level, where they are at. Grouping them maybe. They do different things.

Ad: It means you have to meet kids where they're at right? So like, this has been the hardest part about being a teacher is I have 24 kids, a third of my group is quite high but another third is like two grade levels below so it doesn't make any sense to make them do the same thing. Sometimes I have to teach the same lesson but quite often the activities I give are completely different because kids are in different places so learning needs to be personalized.

The next teacher's response also highlights the interrelatedness of instruction and assessment. How do we differentiate instruction without differentiating assessment? The two are intertwined.

Al: Well I'm thinking differentiation for personalization and I know I have a few students who are not at grade level in mathematics so I have been – especially on assessments – I've been assessing them on grade 4, and grade 5 math concepts that I know they don't know even though they're supposed to know so I'm not going to give them a test on grade 6 stuff and have them not get any questions right. So I think personalization is understanding that the curriculum shouldn't be treated like a checklist although it would be amazing if all my students were doing really well. So I think personalization is differentiation and being able to pick and choose what is most important that these kids need to learn.

Two things caught my attention from these responses. First, there seems to be some confusion among teachers regarding the difference between personalized learning and differentiation. Second, when told that personalizing instruction, as defined by the Ministry, means catering to individual interests, teachers said they already do that to the best of their ability, but that they don't really have time. This is consistent with Ehrcke's (2013) comment that I referred to in Chapter 6: "That level of personalization would [...] require smaller classes, more teachers and a greater range of educational programs in all schools" (p. 74).

8.4. Discussion

Through this analysis, it has become evident to me that the language of the mathematics curriculum is not clear. Both the terms and phrases themselves, and the learning standards, are vague. It has also become clear to me that more clarity does not necessarily imply less flexibility. The teachers I spoke with do not want a curriculum that

is more prescriptive – just for one they can understand. One teacher’s comments summarize the findings from this chapter nicely:

I think more clear language and more specific examples. I’d like to see more links rather than like I noticed they had on the side there a little bit of referencing some different books or Aboriginal stuff or whatever but it’s like do I have time to find those books? To search where they are? If they had a link to it, right? A link to a website, a link to even a picture of the book, a video, whatever. It would be much more effective for teachers to have it all there instead of sending us off on wild goose chases.

It would be an interesting follow-up study to see if, as Graybeal found, this lack of clarity results in teachers ignoring to some degree, the direction given by the Ministry in this curriculum. As noted earlier, Graybeal’s (2010) study revealed that, “Teachers felt they could use their discretion and ignore vague, inconsistent and controversial messages” (p. 1).

Chapter 9. Discussion and Conclusions

As we come to the end of this analysis, I find myself looking back at the different components – some that had been planned from the beginning, and others that I added in along the way – and what each of these has revealed, as well as what story they tell together. Chapters 5, 6, and 7 are summaries of the analyses that I conducted using Halliday’s three metafunctions. Through the analysis of the interpersonal and ideational functions in Chapters 5 and 6, it became evident that the Author uses complex literary constructions – such as animating the inanimate and the use of the passive voice – throughout the curriculum to conceal themselves. It is from this position of anonymity that they set the expectations of teachers and students – expectations that often do not align with the narrative of choice and personalised learning presented in the introductory documents. They also use persuasive language in these introductory documents to promote this curriculum to the public. The ideational analysis also revealed a set of beliefs and assumptions held by the Ministry about who the learners in our classrooms (and their teachers) should be(come). These beliefs and assumptions conform to a Western worldview – especially in terms of the value placed on rational thought and productivity.

Chapter 7 acts like a bridge to some degree, between the previous two chapters and the chapter that follows on clarity. The textual analysis in Chapter 7 confirmed the persuasive nature of the introductory documents, and the lack of cohesion and intertextual inconsistency in the curriculum. Considering the GSPs from the perspective of the textual metafunction proved especially powerful as this revealed an overall lack of texture in the GSPs. Perhaps this was intentional as one way to provide flexibility for teachers. Unfortunately, not all teachers see this as such a gift. As was shown in the interviews, many teachers find the lack of clarity frustrating as they feel like they are left not knowing what to teach, especially when it comes to Indigenising the curriculum. In thinking back to what Graybeal found – that teachers tend to ignore vague messaging – I wonder if there are teachers out there who are just ignoring the standards that do not make sense to them.

In Chapter 8 I conducted an analysis of the clarity of the curriculum from three perspectives: using the framework provided by Bergqvist and Bergqvist (2017) to

analyse the clarity of terms, examining the connection between the statements “Students are expected to know/be able to do the following” and the bulleted learning standards that follow; and finally, by considering the alignment between these findings and what the teachers shared with me during the interviews. In hindsight, perhaps I could have embedded the clarity analysis into the ideational component of this text analysis. Bergqvist and Bergqvist’s work provides a nice way to extend the analysis in that direction, in the same way that Morgan and Herbel-Eisenmann’s work offered a finer grained way of looking at the interpersonal function.

Through these different analyses, I came to the overall conclusion that the language in the BC mathematics curriculum is not clear. The Ministry uses ambiguous terms, complex abstract sentences whose meanings are difficult to pin down, and vague learning standards that are only occasionally clarified through the elaborations. The results from the analysis using the textual metafunction (Chapter 7) corroborate this finding, as the lack of cohesion in the document makes it even less clear and more difficult to interpret. One thing that can be gleaned from this is that there are different ways that one can be vague or unclear. I think developing these distinctions could contribute to future work in this area so I will attempt to do so here. I can identify five distinct ways the Author has been unclear in their language: first, by using ambiguous terms or phrases and not defining them (for example, ‘problem’ or ‘to know’); second, by writing complex abstract sentences that leave the reader wondering what they actually mean; third, by writing elaborations that have no semantic connection to their corresponding learning standard; fourth – and this I think is what was intended by the curriculum development team (the teachers) – writing vague learning standards that are open to the interpretation of the teacher; and finally, by not stating their intentions around the intentional vagueness. I think that would have really helped teachers as they would have understood that this vagueness is meant to support them. Because the Author has been unclear on so many levels, I cannot accept the claim that a lack of clarity implies flexibility. Rather, a lack of specificity in the learning standards has the potential to invite flexibility, but this would need to be communicated to teachers.

Overall, the findings from the interviews echoed the results of the Hallidayan analysis. Teachers felt like they were being directed by an anonymous Author, they expressed that the connection between the learning standards and elaborations were not always clear, and they did not understand much of the language in the curriculum – both in

terms of specific words, and the learning standards more generally. What surprised me about the interviews is that almost all the teachers struggle with any learning standards that involve First Peoples. Many teachers expressed frustration about a lack of clarification and support, while others simply rejected some of the standards due to their tokenistic nature.

Although the findings from Chapters 7 and 8 do reveal a missing semantic link between the learning standards and corresponding elaborations, they did not explicitly uncover this challenge that teachers are having. This brings me back to Lamb and Godlewska (2021) who, as noted in Chapter 2, emphasise the need for this initiative to be properly supported:

Making individual educators responsible—consonant with contemporary neoliberal trends in education—and the homogenizing language in the phrasing ‘the Aboriginal voice’ are two areas of concern that call into question just what the Ministry has learned. Given the picture that emerges through our analysis, educating the non-Indigenous student population, and localizing this education, will require significantly increased resources for educator training and re-training and for Indigenous community capacity building. (p.16)

On a side note, the authors also observe that an area of concern is that the Ministry – through the writing of the redesigned curriculum – makes individual educators responsible for carrying out all of its demands. Much of what my study has revealed echoes what Lamb and Godlewska have summarised here.

Overall, the results of the different components of this analysis reinforce each other and reveal much about the language used in this curriculum. These results point to critical issues in the curriculum document, particularly in relation to the limited agency and support given to teachers, the normalising way of framing learners, and the adherence to a Western ideology centred around the rational mind and the self.

I will attempt to bring this together in the following sections, where I respond to the research questions.

9.1. Responding to Research Questions

In this section, I return to the research questions and attempt to address them. In doing so, I hope to bring to light some of the problematic aspects of curriculum design, and

also to invite curriculum writers to consider more deeply the implications of the conscious, and possibly subconscious, choices they make in their writing.

9.1.1. Question 1:

What can we learn about the Author and audience of the BC mathematics curriculum (and their relationship) by using Halliday's metafunctions to examine the voice of the text?

In following Morgan's and Herbel-Eisenmann's method for analysing text using the interpersonal function, it became clear that the Author chose to position themselves as an authority while at the same time concealing their presence. They make claims to the public about the need to transform the education system, they list expectations of students – both in terms of what students need to learn and who they need to become; but nowhere in the curriculum do they identify themselves. The curriculum contains almost no personal pronouns, and no information about the Author. One consequence of this choice is that it sets up a formal and somewhat distant relationship between the Author and the audience. Another consequence is if the Author is hidden, the reader does not know if there was Indigenous representation on the writing team. According to FNEC (2020):

One of the most effective ways to begin teaching Mathematics First Peoples is to establish meaningful connections for students between mathematics skills and “content” and First Peoples themes and topics. To be meaningful, connections must not only be identified at the outset of a teaching unit, but must be systematically revisited at appropriate intervals. The tokenism of periodically introducing one-off, trivial examples or contrived problem situations that promote simplistic, stereotypical aspects of First Peoples traditions will be obvious to most students and will likely fail to achieve any meaningful result. (p. 15)

This tokenism is what seems to be present in the GSPs – Indigenous content listed in the elaborations as a bullet point at the end of the list in the form of a “one-off, trivial example”. So again, who exactly is the Author?

This analysis also revealed that the GSPs were written in a different voice or tone from the rest of the document – one that is more direct and less relational and persuasive than the other sections. Consider again the two sentences I offered in Section 5.3 – the first from the GSPs, and the other from the Curriculum Overview:

Students are expected to be able to do the following: represent mathematical ideas in concrete, pictorial, and symbolic forms. (Province of British Columbia, 2022d,e)

British Columbia's redesigned curriculum honours the ways in which students think, learn, and grow, and prepares them for a successful lifetime of learning where ongoing change is constant. (Province of British Columbia, 2022a)

The Ministry was writing for two (ideal) audiences – the GSPs were written for the teacher, and the other sections were written for a range of stakeholders as well as the public. This, however, is never explicitly stated which means that a teacher might read both parts assuming they are the intended audience, which might complicate their reading—if they knew that part of the text was actually not for them, they might read it quite differently. Alternatively, this could be a moot point as none of the teachers I interviewed have read the curriculum beyond the GSPs. This may or may not be true of other teachers, but it certainly points to the possibility.

These ideal audiences are first, teachers who understand and buy into the messaging of the curriculum, and have time to create all of their own resources; and second, a public group who is willing to accept the unsubstantiated claims provided by the Ministry as rationale for the redesign, and who believes that a redesigned curriculum will be the solution to deeply rooted societal issues that often manifest in the classroom.

9.1.2. Question 2:

What does an analysis using these metafunctions reveal about how the various people referred to by the text (teachers, students, parents, etc.) are conceived or constructed?

As mentioned in Chapter 6, in this curriculum the Ministry introduces two fabricated human kinds – the educated citizen and the problem-solving child – and in doing so creates a division between those who can/will conform to these fabrications and those who cannot/will not. Recall from Chapter 6 that, “these various inscription devices of pedagogy embody principles that normalize and divide and thus embody practices of social inclusion and exclusion” (Popkewitz 2004, p. 5). I find this ironic as the Ministry, on several occasions, cites the importance of inclusion. Here are a few examples from the Curriculum Overview (2022a):

The Kindergarten to grade 12 school system focuses on meeting the needs of all students.

When selecting specific topics, activities, and resources to support the implementation of the curriculum, teachers are encouraged to ensure that these choices support inclusion, equity, and accessibility for all students.

Government policy supports the principles of inclusion of all students.

British Columbia promotes an inclusive education system in which students with special needs are fully participating members of a community of learners.

This division brings up questions that are never addressed in the document such as: Who is left out/behind? What are some consequences of designing a curriculum around this narrow idea of who a child is? What are the consequences of dividing the student population?

Deciding who a learner should be (become) and what they should know and be able to do, and then dividing the population into those who can/do and those who cannot/do not, means perpetuating a system that caters to the privileged. In this sense, the education system mirrors society, where those who have a lot do well, and those who have historically been marginalized continue to be so. This is not equitable. The Author even writes in the Curriculum Overview (2022a) that, "Curriculum used in British Columbia remains designed for the majority of students". As mentioned above, this contradicts the Ministry's commitment to inclusion and to meeting the needs of all students. What if, instead of pre-determining the mathematics for the student, we learned to honour the mathematics *of* the student (Tan et al., 2019)? What about designing from the margins (Lambert, 2022), and allowing our marginalised students to inform our practice? Below is an excerpt taken from the Curriculum Overview. I have attempted to re-write it to illustrate how a more inclusive curriculum might be worded.

Supporting Diverse Learners

B.C educators strive to ensure that all learners are supported to participate in school, to develop their individual potential, and to acquire the knowledge, skills, and attitudes they need for a successful personal future and to contribute positively to society and to the economy. Curriculum used in British Columbia schools remains designed for the majority of students,

with classroom teachers continually personalizing their instruction and assessment methods for students as appropriate.

Government policy supports the principles of inclusion of all students. Students with special and/or ELL needs can achieve the prescribed learning standards through the strategic use of personalized instruction and assessment methods.

I wonder what the impact would be if this had instead been written as follows:

Supporting the Diversity of Our Learners

B.C educators strive to ensure that all learners are supported to participate in school, to develop their individual potential, and to acquire the knowledge, skills, and attitudes they need for a successful future – whatever that may look like for them. For this reason, curriculum used in British Columbia schools has been re-designed for *all* students. We know teachers will need support in personalizing their instruction and assessment methods so we have compiled a wealth of resources on our website including videos, lesson plans, and stories from teachers. We will provide time for inservice so that school teams can take the time to go through this material carefully. Because we believe that every student deserves a rich learning experience, we also commit to having at least one full-time educational assistant in every classroom, regardless of the designation status of the students.

Government policy supports the principles of inclusion of all students. Therefore, students with special and/or ELL needs will be provided with even more support so that they can achieve the prescribed learning standards through the strategic use of personalized instruction and assessment methods.

I hope that by providing this alternative, the reader might come to see how non-inclusive our curriculum actually is, and how much more work needs to be done if the Ministry is serious about equity and inclusion.

Beyond the notion of the problem-solving child, there is the issue of so many goals and expectations being put on the child, which creates further division in the sense that some students may not reach these goals or meet these expectations. And when school outcomes are listed as expectations of the student or teacher, there is an implicit assumption that if these expectations are not met, it is due to some 'technical' issue (Gutiérrez, 2008): teacher mathematical knowledge, technology use in classrooms, students not completing homework, etc. The reality is that there are much larger societal issues at play, such as an underfunded education system based on Western capitalist values, and a skewed distribution of wealth in our society which often requires

caretakers to spend more and more time out of the home working. Such societal problems contribute to a lack of support for marginalized students, over-worked and under-resourced teachers (and families), and, ultimately, an inequitable education system. It is often expected that teachers will ‘close the gaps’, and meet the needs of all students, while these larger issues remain unaddressed in the BC curriculum. I imagine the Ministry is well aware of this, as not naming the Author is a choice that removes the potential blame from the Ministry or even the document. Moreover, since the purported audience is the teacher and because teachers are named several times in the introductory material, they become the ones held accountable.

There is also a more implicit construction or assumption of an ideal teacher (see Chapter 5), one whose beliefs align with those of the Ministry, and who is willing and able to carry out all that is mandated of them in the curriculum – even if that means doing so with minimal resources and support. Here are just a few excerpts from the Curriculum Overview that illustrate this:

Teachers are encouraged to create courses, modules, thematic units or learning experiences that go beyond learning area borders to focus on students’ needs and interests or local contexts.

What if it said this instead:

Because teachers need to focus on their students – on personalizing and differentiating their instruction and assessment, we have created courses, modules, thematic units and learning experiences that go beyond learning area borders to support them in focusing on students’ needs and interests or local contexts.

This seems more reasonable. If the Ministry really wants teachers to teach well and continually personalise instruction and assessment, they cannot at the same time ask teachers to design so many of their own resources. It seems to me that there is simply not enough time in the day to do both things well.

Here is another example:

When selecting specific topics, activities, and resources to support the implementation of the curriculum, teachers are encouraged to ensure that these choices support inclusion, equity, and accessibility for all students. In particular, teachers should ensure that classroom instruction, assessment, and resources reflect sensitivity to diversity and incorporate

positive role portrayals, relevant issues, and themes such as inclusion, respect, and acceptance.

Of course teachers should be watching for these things – this is nothing new. I wonder, though, why teachers are also responsible for vetting resources. Would it not be more efficient to have a library of vetted resources available for teachers to access?

And one final example:

The focus on flexible teaching and learning enables teachers to confidently choose the strategies, resources, and applications best suited to the needs of students in their local setting.

This is simply not true. The focus on flexible teaching and learning cannot enable anything on its own, but more importantly, I know very few teachers who feel confident about their ability to choose such strategies, resources and applications.

What if the Author had instead written this:

We know that our decision to encourage more flexible teaching and learning comes with some ambiguity. To mitigate this, we are posting a series of vignettes on the curriculum website that illustrate how teachers can choose strategies, resources, and applications best suited to the needs of students in their local setting. Please contact us if you need further support or information.

Teachers are expected to do these things with a curriculum that may make very little sense to them – all with no support from the Ministry, while also teaching full-time. This ideal teacher will create their own resources and assessments or find and vet existing resources, being sure to take into account major societal issues such as equity, inclusion, and diversity – within a curriculum designed for “the majority of students”. A real-life teacher might ask why the Ministry has not provided some of these resources.

9.1.3. Question 3:

How clearly is the redesigned mathematics curriculum communicated?

Bergqvist and Bergqvist (2017) note the importance of the design of formal written curricula and list several studies in which the design of policy documents has been examined. These authors share findings from these studies, and conclude, “The strongest result regarding aspects of the formal written curriculum is that the reform

message has to be clear” (p. 153). They explain that vagueness can lead to different interpretations of a message and that, “The goals have to be clear through, for example, the use of definitions, concrete examples, vignettes and explanations” (p. 153). They also cite several studies that showed curriculum documents to be vague and ambiguous. Finally, these authors turn to the issue of alignment, explaining the importance of different parts of the curriculum conveying the same message.

I considered clarity from several perspectives. Using Bergqvist and Bergqvist’s framework to analyse the clarity of terms in the redesigned mathematics curriculum, I found that the key terms used in the document are not communicated clearly. For example, the word ‘problem’ occurs 33 times in the pages I analysed, but is never defined, explained, or exemplified. Moreover, because of the difference in definitions in the dictionaries I used, this term can also be considered ambiguous. My own more holistic analysis of the learning standards revealed that these are also not communicated clearly. Consider the following excerpt from the Grade 6 GSPs:

Students are expected to know the following:

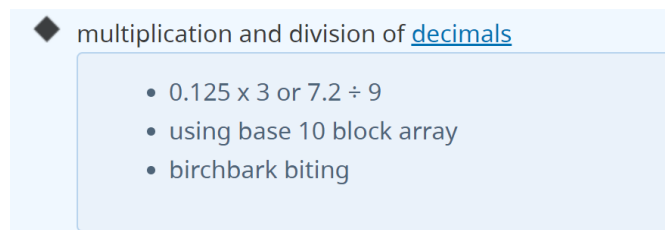


Figure 9.1. A Content Learning Standard from the Grade 6 GSPs

I have referred to this standard earlier, but I wanted to highlight it again here as it is unclear on so many levels. First, what does it mean to know multiplication and division of decimals? Second, the elaborations do not offer much in terms of clarification. Do students only have to multiply or divide decimals by one-digit numbers? What is a base 10 block array? How does multiplying and dividing decimals relate to birchbark biting?

This result (that the language in the curriculum is not clear) was corroborated by the teachers I interviewed. Finally, a Hallidayan analysis of the textual metafunction revealed that the curriculum lacks intertextual coherence. In other words, there are conflicting messages in the curriculum. Should teachers try to direct their students toward the fabricated ideal student presented by the Author, or allow them to be who they are and

personalise accordingly? Can teachers truly create an inclusive learning environment with minimal or no support in the classroom, or should they resign to teaching “the majority of students” for whom the curriculum was designed?

To summarise, the mathematics curriculum is not clearly written. It contains very few definitions of key terms, no vignettes, and some explanations in the form of elaborations, although many of these do not clarify the corresponding learning standard. Moreover, the learning standards are unclear, and different parts of the curriculum convey different messages. There are several possible explanations for this. Perhaps the Ministry is trying to make different stakeholders happy so proposes multiple and perhaps conflicting messages. Or maybe it is because the authors of different parts are different. I know that teachers wrote some or all of the GSPs. Or maybe the Author thought being less vague would constrain teachers. I would also like to point out an important distinction. Writing a vague learning standard to widen the range of students who can have success is very different from an author writing a curriculum that contradicts its own previously stated values. So, the lack of clarity is operating on several different levels. In speaking with colleagues who were on the writing team, I now know that the vagueness in the GSPs was intentional as a way to include more learners, and to offer more flexibility to teachers. If teachers wrote the GSPs, that also explains the value gap between the Ministry’s commitment to “ensuring that Indigenous content is a part of the learning journey for all students“, and what actually ended up in the GSPs. I also know that the writing team was rushed. Perhaps it would have been worth the time for the Ministry to work with the curriculum development team until there was both logical and ideological consistency between the two documents.

9.2. Strengths and Limitations of this Study

The primary strength of this study is that it offers a theory-backed critical analysis of British Columbia’s redesigned curriculum. Gutiérrez (2013) notes the usefulness of a concept called “transparency”, which she defines as, “The process of making the familiar seem strange, deconstructing the operating paradigms, and making the taken-for-granted rules of the game more explicit” (p. 50). I think it is important, especially with documents and policies that impact so many people, to examine the unexamined – to question assumptions and motivations, and to show that there are other ways to do things, more equitable and inclusive ways. The most obvious taken-for-granted rule that

I think needs examining in this case, is that the curriculum and corresponding fabricated human kind are both based on Western values. This needs to be made strange, as it is not an inclusive ideology, and does not accurately represent a province that is working toward reconciliation.

Another strength of this study is that it highlights the power structures in curriculum design and reveals who benefits from the curriculum. It also demonstrates that even progressive and well-intentioned changes in curriculum can have unanticipated and negative consequences. This study also provides some alternate paths, which I have offered some samples of in the alternative text that I propose here and there in my thesis. I think these highlight the power of choice in language.

Two limitations are, first, that I only interviewed a small group of teachers which makes my sample size quite small. The results of the interviews would have been more powerful had I interviewed say 50 teachers, and from more than one district. I do not have reason to think other teachers would feel differently, but I would be able to make claims with more certainty if more teachers were saying the same thing. Second, I only analysed this curriculum so I am not sure if the things I identify as functions of the redesigned curriculum are in fact just what all curriculum documents look like. Based on what I have heard anecdotally from colleagues though, our curriculum is indeed unique. They have shared with me that other Canadian curricula are overly prescriptive and *too* detailed. I think the BC curriculum is unique in its openness and in the freedom it offers teachers. Unfortunately, some teachers do not understand it this way. Perhaps it would have behooved the Author to explain the rationale behind this choice.

9.3. Implications of this Study

Analysing British Columbia's redesigned mathematics curriculum through the lens of Halliday's metafunctions allowed me to consider the language used in the curriculum in terms of ideology and choice, and on all three levels – the interpersonal, ideational, and textual – this was powerful. Those who have come before me in curriculum analysis – whom I have referred to in this work – helped me to see so much that I did not see before. For example, without the work of Morgan and Herbel-Eisenmann, I would never have thought to analyse the interpersonal aspect of the curriculum by looking at personal pronouns, imperatives, and modality. Also, I had a sense of the Ministry's conception of

an ideal child and how that could be problematic, but I would never have been able to articulate it as I have done here without the work of Popkewitz and his colleagues. Having had this opportunity to analyse the curriculum has also impacted my own work. For example, I was recently at a leadership conference where the topic was inclusion and social justice, and I was able to share the line from the curriculum that says it is designed for “the majority of students”. My colleagues could not believe it and even asked me to show them. I was able to draw attention to one of the choices that was made by the Ministry, and invite teachers to question that choice.

Because so much was revealed from using Halliday’s metafunctions with Bergqvist and Bergqvist’s work on clarity to analyse this curriculum, I would recommend this framework as a tool that other curriculum researchers can use. Specifically, this analysis revealed and made explicit choices made by the Author, the way the Author constructed its audience, and the level of coherence of the text as a whole. This study contributes to curriculum research as it offers a comprehensive and systematic way of analysing curriculum.

My hope is that this analysis might invite others to examine and challenge documents and policies that we often accept without question. The findings of this study point to a need for curriculum writers to consider the impact that their language choices will have on their audience, and to be more mindful in their writing of the humanness of teachers and students alike. If curriculum writers want teachers to change, they must support them along the way.

For me, the most significant implication of this research is that it brings to light a question that has bothered me from the beginning: why are we, as a society, content with a curriculum that divides the population? Moreover, why is ‘acceptable’ for our education system only to support the group that is ‘successful’? What is to come of the “what-if-not” group? Do we cast those children aside, or do we, as a society, look toward a more equitable system that embraces all of our learners? This question is of utmost importance, especially in a time when equity and inclusion are at the forefront of mathematics education.

9.4. Possibilities for Future Research

I returned from the 2022 NCTM conference in Los Angeles just before writing this conclusion and some of the sessions I attended highlighted the need for us to open up our mathematics classrooms in such a way as to include all learners. I was fortunate enough to attend Rachel Lambert's session entitled, *UDL Math: A Framework for Designing Inclusive Mathematics Classrooms*; as well as a session by Jenna Laib: *Rethinking Pre-Assessments: Gathering Data with Equity in Mind*. Attending these sessions strengthened my belief that a mathematics curriculum should be for everyone, including the teachers. An opportunity that I see for future research is to experiment with different, more equitable and empathetic models for curriculum design that are more inclusive of different learners, and more supportive for teachers. It might also be worthwhile to explore what clarity might look like in a mathematics curriculum. How can a curriculum be clear and still flexible? What would this look like?

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