

Numbers for Truth and Reconciliation: Mathematical Choices in Ethically Rich Texts

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Abstract

Indigenous children were taken from their families and placed in residential schools since the 1870s and until 1996 in Canada with the aim to “kill the Indian in the child.” A Truth and Reconciliation Commission (TRC) was formed in 2008 to provide victims of these schools the opportunity to recount their experiences in a safe and culturally appropriate manner. After five years of gathering these experiences, the TRC report summarizes what was heard, and identifies 94 calls to action. We will show how numbers are used and not used in two TRC documents. We identify the value of such analysis for school and university mathematics teachers as an example of a culturally situated use of number for rhetorical purposes, which relates to the ideas of culturally responsive teaching and critical mathematics education. Not only does this kind of learning address calls for democratic and critical citizenship, it belongs in Canada’s new age of responsiveness to Indigenous experiences of colonialism.

Introduction

Indigenous children were taken forcibly from their families and placed in residential schools since the 1870s and until 1996 in Canada. Mi’kmaw scholar, Marie Battiste (2013) described the aims of these residential schools: “Residential schools were intended to root out and destroy Indigenous knowledge, languages, and relationships with the natural family to replace them with Eurocentric values, identities, and beliefs” (p. 56). This description is reflected in the Canadian Prime Minister’s apology for residential schools in 2008, in which he identified that the goal of residential schools was seen by many Canadians to be to “kill the Indian in the child” (Indigenous and Northern Affairs Canada, 2008). A Truth and Reconciliation Commission (TRC) was formed in 2008 to provide victims of the residential schools the opportunity to recount their experiences in a safe and culturally appropriate

manner. After five years of documenting these experiences, the TRC (2015a and 2015b) summarized what was heard, and identified 94 calls to action.

We will show some aspects of how numbers are used and not used in two TRC documents called *Honouring the truth, reconciling for the future. Summary of the final report of the Truth and Reconciliation Commission of Canada* (TRC, 2015a) and *What we have learned: Principles of truth and reconciliation*, both compiled by the Truth and Reconciliation Commission of Canada (TRC, 2015b). We selected these documents for their political importance; they are the reports of a widely publicized process of reconciliation. Additionally, they are probably the most comprehensive documentations of Indigenous individuals' experiences in Canada. Our analysis comprises a critical (ethno)mathematical approach to identifying how number is used for the specific practices of reporting the residential school experience. We underline that this article is written in an academically idiosyncratic way. Hence, there is no clear research question or methodology section where a research question is analysed. We rather aim to identify questions and ways to analyse the document that may allow university and school teachers to use the documents as a base for teaching mathematics and political mathematical analysis. Our reading of the documents helped us identify these questions, which are presented in our discussion at the end of the article.

We identify the value of such analysis for school and university mathematics teachers as an example of a culturally situated use of number for rhetorical purposes. We claim it is necessary for mathematics educators to help their students understand how number can be used politically and how numbers can be positioned in such contexts. Not only does this kind of learning address calls for democratic and critical citizenship, it belongs in Canada's new age of responsiveness to Indigenous experiences of colonialism.

Positioning Ourselves

One of us, David, grew up in Canada in an immigrant family. David's father immigrated to Canada in the 1950s, and his mother's family immigrated in the 1920s. While growing up and through formal education, he heard very little about Indigenous people in this part of the world. He recalls reading encyclopaedia entries and school textbooks that romanticized certain traditional skills, lauded some of the First Nations' roles in military victories (against the USA and in World Wars), and depicted the Indigenous people as simple and backward. As an adult he developed friendships with some Indigenous people who did not talk about the experience of being colonized, and he attended some lectures and panel discussions that opened his eyes a little to colonization. When he prepared for three years of work in Swaziland with a social justice advocating organization (Mennonite Central Committee), he started to read more extensively about the impact of colonization in Africa and North America.

In Swaziland he heard many narratives of deep scars from colonization, and he continued to read widely. News accounts of hearings from South Africa's Truth and Reconciliation Commission and Krog's (1998) book tracing the entire process gave him insight into the complexity of such redemptive exercises, and got him thinking about the potential effects of different ways to document and otherwise represent a painful colonialist past. Antjie Krog is a news reporter and a prolific published poet. Her book is a fusion of straightforward reporting, fictionalization to protect some identities, and poetry.

Upon David's return to Canada in 1999, he was more attentive to the impacts of colonization—prompting friends to talk with each other about their feelings and experiences as colonizers and colonized, and engaging in conversations with knowledge keepers (elders) and other leaders in some Mi'kmaq and Wolastoqiyik communities in the East of Canada. Some of these conversations have been part of research projects (e.g., Wagner & Lunney

Borden, 2015) and related school-based initiatives including the *Show Me Your Math* events (e.g., Lunney Borden & Wagner, 2011; Lunney Borden, Wagner, & Johnson, 2017; Wagner, 2016).

David identifies as a settler (as opposed to Indigenous) in Canada, and recognizes his status as a treaty person. It is common in Canada to think about Indigenous people as living under treaties with the Crown (the term to represent the government of Canada), and to use the term ‘status’ to refer to Indigenous people. These identifiers normalize the occupation of the land by settlers and depict the Indigenous as not normal. However, the treaties are between nations, and so every Canadian is living under the terms of the treaties. David has come to recognize his status through conversations with local knowledge keepers. Some of us in Canada say that we are all treaty people. Epp (2008) has written about this idea and many Indigenous leaders have said it, yet it is an idea that can be expressed tritely, as identified by Tupper (2011). Some Indigenous scholars in Canada encourage settlers to write about their experiences as treaty people while others warn against scholarship about Indigenous experiences without Indigenous co-authorship. We think of our work as Indigenist, in the sense described by Battiste (2013), as part of our ongoing collaborations with Indigenous people—with an interest in Indigenous peoples’ goals. Our work addresses settler people as much as it does Indigenous people.

Annica’s relationships with Indigenous people have been very different. Both on a professional and a personal level, she has felt drawn to Indigenous communities. Her personal interactions with Indigenous people have always given her feelings of hominess and recognition. During the last decade, she has been invited to be part of in-service teacher education in Papua New Guinea, where she also spent time in villages in the highlands where the mathematics teachers in the local schools overcame significant challenges as they aimed to situate the mathematics in the cultural and linguistic experiences of the children. Then, in

2010, Annica worked together with Inuit in-service teachers over a year in a masters program in Greenland. Here too, the teachers described their challenges to make mathematics appropriate and accessible for children in their cultural and linguistic contexts. The textbooks in the Danish language did not support their work and even seemed to undermine it. Annica has also been invited to Sami teacher conferences in Sweden, and has engaged in interesting, challenging, and loving conversations about both Indigenous and non-Indigenous mathematics teaching with Sami researchers and PhD-students.

During Annica's stays at the University of New Brunswick in 2015 and 2016, she became attentive to the experiences of Canadian Indigenous people, both professionally at UNB and personally with new Indigenous friends. She admired the *Show Me Your Math* events in which mathematics was situated in individual students' cultural experiences and became engaged in research conversations and projects at the University (UNB). One weekend in early November Annica carefully read the TRC documents, which brought tears to her eyes. She found that the narratives and numbers shared in this vital document were honest, naked, and emotionally challenging to read. Furthermore, having grown up in Sweden, she recognised that the history and knowledge of the colonization and boarding schools are not uniquely Canadian Indigenous experiences; similar narratives and history are shared with the Scandinavian Sami peoples.

Our Focus

Annica's rough emotional experience when reading the TRC documents prompted her to reflect on how numbers were used throughout the text in the documents, and how numbers were not used. She noticed that the numbers were used in some chapters while in others there were hardly any specific numbers identified, in which cases the arguments were instead phrased more vaguely with words such as *many*, *few*, or *less*, or with no numeric words at all. These reflections on how numbers are (not) used and the consequences of these choices in the

significant TRC report struck her as an important and critical discussion for teachers to have with students while teaching about the political importance of knowing and recognising mathematics in relation to Indigenous history.

This is our reason for writing this article. We aim to support Indigenous and non-Indigenous mathematics educators to use the TRC documents or other similar documents as examples of people working critically with numbers. We understand this in line with aspects of both a culturally responsive teaching as suggested by for example Gay (2013) and a critical mathematics education (Skovsmose, 2010). Mathematics teachings inspired by aspects of critical mathematics education are also shown to motivate and inspire students that are not usually interested in mathematics, or even hate the subject (Andersson, 2011; Andersson, Meaney & Valero, 2015). The TRC documents are important in themselves and thus worth the attention of students and teachers. We believe that critical attention to them can foster deep reflection on the experiences of hurt people and the challenges of discussing the pain.

For this article, we focus on two of the TRC (2015a, 2015b) documents. While the Commission and its documents have powerful significance in the Canadian context, they also concern citizens in other countries where colonisation has deprived Indigenous communities their languages and cultures. In this article, we focus on the way the authors of these two TRC documents used mathematics to help them represent the impact of colonization in this part of the world and of residential schools in particular. We celebrate the way the authors used mathematics to respectfully represent events and experiences that are difficult to document due to the pain and terror involved. Putting a number on pain or terror is a problematic endeavour but helpful in some cases (as we see here). So, we pay attention to what they numbered/counted and what they did not. We also consider how they numbered items.

The rhetorical power of numbers

It is not a surprise to us to see mathematics used in the context of this TRC document, as we, in our previous roles as school mathematics teachers often extolled the power of mathematics to document truth. This valorization of mathematics appears in our more recent writing too, though with more caution about the dangers of using mathematics to construct truth while obscuring human subjectivity.

For example, David was the lead author of the mathematics chapter in UNESCO's (2017) book *Textbooks for Sustainable Development: A Guide to Embedding*, and wrote "Mathematics gives people power to trump status with reason. [...] By giving us comparison tools (statistics, for instance), it can be used to convince people of injustices and prejudices" (p. 42). In particular, that chapter identified the power of mathematics to identify racism: "usually one does not need mathematics to identify racism in a particular interaction because it is identifiable in the language and actions of the people involved. However, we can use mathematics to chart patterns of interaction, which make it possible to identify racism in the system" (p. 45). The value of mathematics for identifying systems of oppression will feature prominently in our analysis below. Indeed, the analysis below was influential in the construction of the chapter quoted in this paragraph.

The apparent objectivity of numbers in the way they are usually represented gives users of mathematics the power to claim objectivity and to render contentious ideas as inevitable and incontrovertible. Almost a century ago, Dantzig (1930/2005) described how mathematics is typically seen as unerring and free of human subjectivity: "For here, it seems, is a structure that was erected without a scaffold: it simply rose in its frozen majesty, layer by layer! Its architecture is faultless because it is founded on pure reason, and its walls are impregnable because they were reared without blunder, error or even hesitancy, for here human intuition had no part!" (p. 188). However, he has shown that history shows this to be false—human

choice and fallibility are indeed part of mathematics. Porter (1995), a historian, has shown how quantification is inherent in democracy because bureaucrats and even elected representatives need to make decisions that appear unbiased: “Quantification is a way of making decisions without seeming to decide” (p. 8). This apparent objectivity is also used to construct a truth that is difficult to contest. Chassapis (2017), who was a cabinet minister in Greece as it was embroiled with its European partners in a fiscal crisis, gave a plenary lecture at the 2017 Mathematics Education and Society conference, and described the problematic politics of mathematical models and statistics in contesting views of how Greece should deal with the crisis. In this crisis context, he demonstrated how “numerical genres and their projections on the front pages of newspapers contributed to the construction of a regime of truth [...] aiming to present the policies adopted as inevitable and to mitigate the social and political oppositions to them” (p. 45).

The hidden human subjectivity in mathematics, which makes possible this kind of truth manipulation is partly attributable to choices in representation. It is possible to represent numbers and models while also drawing attention to the choices behind them—who decided what should count and not count, who constructed a model based on what assumptions, etc. Nevertheless, we point out that loss of subjectivity is characteristic of mathematics and especially to the way it is taught in schools. Balacheff (1988) described how “The elaboration of [...] functional language requires in particular: decontextualisation, depersonalisation, [and] detemporalisation” (p. 217). Mathematics as a discourse system makes masked agency seem normal. It is possible to identify subjectivity when writing or speaking about mathematics but it is hard to do this; it would seem unnatural.

Further to the nature of masked subjectivity in mathematics and the associated sense of incontestability, there is another aspect of mathematics that became important to our analysis below. Mathematics makes possible the documentation and analysis of large quantities of data

in situations quite removed from the realities being documented. Bishop (1990) described how this aspect of mathematics made colonialism possible. In particular, place value number systems make it possible for people to consider and manipulate large numbers of people and things.

The examples we identify above point to instances of people using mathematics to manipulate and control others. However, as we noted as teachers, it is possible to use mathematics to counter such manipulations and to rectify injustices that are partially attributable to these manipulations. Scholarship in mathematics education provides some rich examples of mathematics teachers leading their students to use mathematics for social justice (e.g., Andersson, 2011; Gutstein, 2008). Generally speaking, when we as educators use mathematics for social justice, we happily emphasize the truths that we construct as alternate to mainstream truths, but not always acknowledging the critiques of mathematics' apparent certainty.

Our ethnomathematical analysis was initially inspired by Bishop's (1991) six mathematical activities. In this paper, we focus on counting so we will not describe our orientation to Bishop's other five activities, except to note that communicating plays a role in number work. We see counting as a systematic way to compare and order discrete phenomena. Number work may involve marking tallies, using objects such as beads or knots as indices for correlated objects, and language repertoires to identify quantity and actions relating to counting. As noted above, numbers are tools for suggesting objectivity, and they make possible the consideration and manipulation of information remotely. Our analysis shows that numbers are mainly found (in high numbers) in the sections concerning deaths, health, assaults and imprisonment.

Indices for People

Numbers were identified as indices for people in the TRC (2015a, 2015b) documents. When a number refers to a person in this way, it strips the person of other identities. For a strong example of this, a residential school survivor is quoted saying, “I remember that the first number that I had at the residential school was 95. I had that number—95—for a year. The second number was number 4. I had it for a longer period of time. The third number was 56. I also kept it for a long time. We walked with the numbers on us” (TRC, 2015b, p. 12).

A softer form of indexing in the TRC documents is evident where numbers were used to specify the nature of injustices in proportionality and cardinality. For example, proportionality was foregrounded in this quote: “In nearly 50% of the cases (both in the Named and Unnamed registers), there is no recorded cause of death. Tuberculosis accounted for just less than 50% of the recorded deaths (46.2% for the Named Register, and 47% for the Named and Unnamed registers combined)” (TRC, 2015b, p.62). With these numbers the identities of the suffering children were abandoned to foreground the systemic disinterest in the identities of Indigenous children—identifying deaths without concern for the causes. The scope of injustice was highlighted with cardinal numbers in this quote: “The Indian Residential Schools Settlement Agreement provided compensation to students who attended 139 residential schools and residences. The federal government has estimated that at least 150,000 First Nation, Métis, and Inuit students passed through the system” (TRC, 2015b, p. 6). Where numbers were used to identify proportionality and scope, they were presented as indisputable, assuming that readers will trust the due diligence of the TRC officers.

While indexing people with numbers has its dangers, less disturbing examples of number indexing are prevalent in our experiences. We take numbers to mark our spots in queues, we are given student numbers, government identification numbers, passport numbers, etc. We are counted in censuses and demographic reports. We are not disturbed by our identities being

overlooked in particular situations as long as we are allowed to maintain our identities in other situations. The example of the child being given a number is most heinous in the context of him being removed from his home, his family, his culture, and even his siblings who were at the same residential school. Using numbers to show societal patterns of action, as with our other two examples above, ignores the identities of the people involved but does not make that ignorance (ignore-ance) absolute.

Vagueness, Specificity, and Trends

The reports (TRC, 2015a and 2015b) identify the value of statistics by using numbers to help readers understand the experiences of residential school survivors, and by criticizing the lack of good records: “Often, the existing record lacks needed detail. For example, it was not uncommon for principals, in their annual reports, to state that a specific number of students had died in the previous year, but not to name them” (TRC, 2015b, pp. 60-61). With the absence of good records some of the numbers reported could be specific and others needed to be vague. It is unclear to readers when vague, rounded numbers were used for the absence of specific numbers or for other rhetorical purposes, but the use of many specific numbers suggests to readers that the authors of the report had an interest in specificity. We think that their interest in specificity is a way of recognizing individual victims. For readers to understand the point of an argument, the difference between a specific number and a rounded number is not significant, but the specific numbers helps readers remember that each individual who suffered was significant.

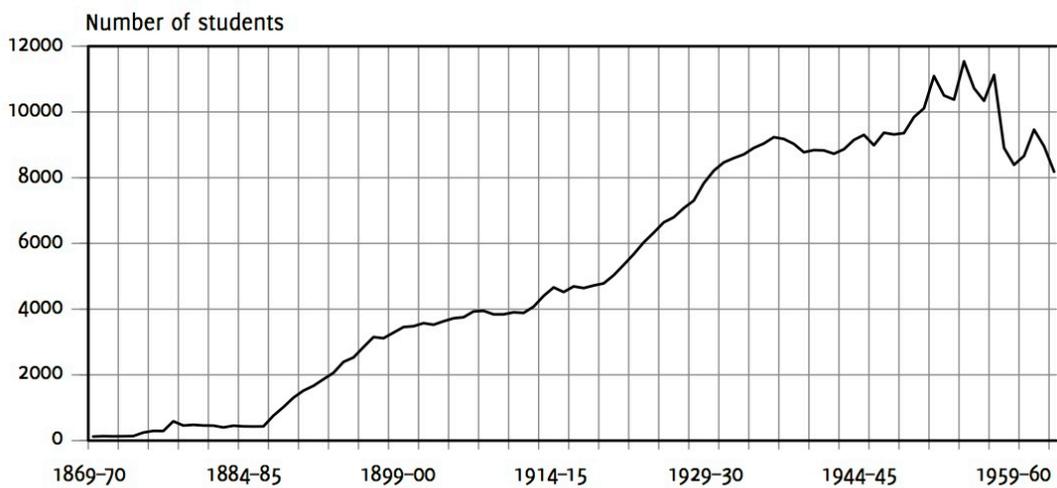
In this example, specific numbers are used to document the degree of residential school enrolments. “From 1945–46 to 1954–55, the number of First Nations students in Indian Affairs day schools increased from 9,532 to 17,947” (TRC, 2015b, p. 39). Every one of these children counted. In this example, the scope of the residential school experience is highlighted without exact numbers: “For tens of thousands of Aboriginal children for over a century, this

was the beginning of their residential schooling. They were torn from their parents, who often surrendered them only under threat of prosecution” (p. 9). The following example refers to an investigation done by the chief medical officer in 1906, and it includes specific numbers, rounded numbers, and a stated interest in accuracy:

He gave the principals a questionnaire to complete regarding the health condition of their former students. The responses from fifteen schools revealed that “of a total of 1,537 pupils reported upon nearly 25 per cent are dead, of one school with an absolutely accurate statement, 69 per cent of ex-pupils are dead, and that everywhere the almost invariable cause of death given is tuberculosis.” He drew particular attention to the fate of the thirty-one students who had been discharged from the File Hills school: nine were in good health, and twenty-two were dead. (TRC, 2015b, p. 66)

The document also uses a few graphs, which show generalities at the loss of specificity. Line graphs, such as the one reproduced in Figure 1, show trends, which are hard to see by numbers alone. This particular line graph in its notes below also highlights the regrettable incompleteness of the statistics available.

Residential school enrolment, 1869-70 to 1965-66

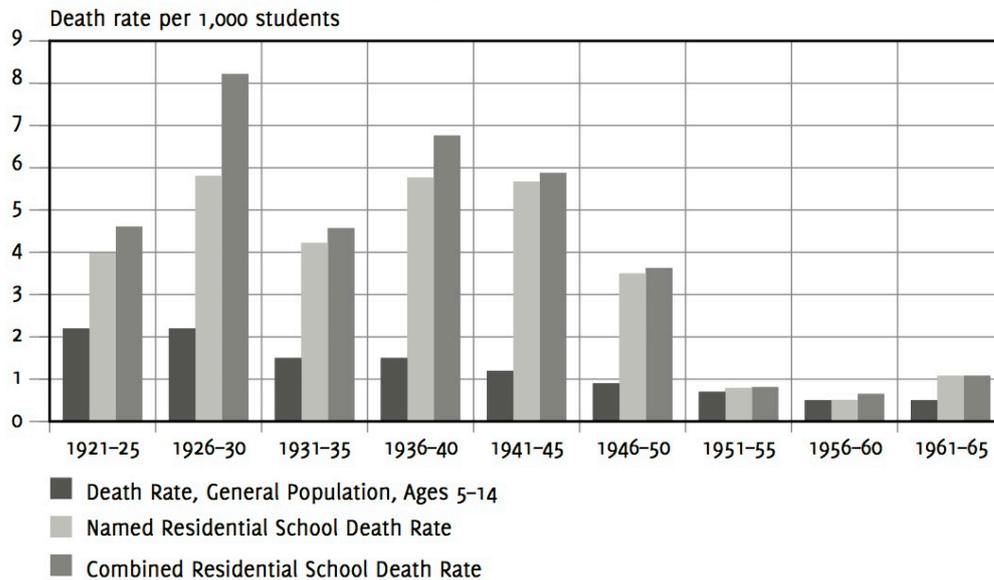


Source: Indian Affairs and Northern Affairs annual reports. After the 1965-66 school year, Indian Affairs stopped reporting on annual residential school enrolment.

Figure 1 Line graph in TRC (2015b, p.35) showing trends

The bar graph in Figure 2 again glosses over specificities and the experience of individuals in order to highlight comparisons across populations.

Comparative death rates per 1,000 population, residential schools (Named and Unnamed registers combined) and the general Canadian population of school-aged children, using five-year averages from 1921 to 1965.



Source: Fraser, Vital Statistics and Health, Table B35-50, <http://www.statcan.gc.ca/pub/11-516-x/section-b/4147437-eng.htm>; Rosenthal, "Statistical Analysis of Deaths," 13.

Figure 2 Bar graph in TRC (2015b, p.64) showing comparisons

The bar graph makes it very clear that there were significant system issues with residential schools. Especially from 1921-1950, the death rate of children in residential schools was significantly higher than for children of the same age range.

The TRC document authors used such comparisons widely to identify differences in treatment between Indigenous and general populations in Canada. Examples from TRC (2015b) include:

- Education: "In 1937, Indian Affairs was paying, on average, \$180 a year per student. This was less than a third of the per capita costs at that time for the Manitoba School for the Deaf (\$642.40) and the Manitoba School for Boys (\$550)." (pp. 30-31)
- Incarceration: "Once Aboriginal persons are arrested, prosecuted, and convicted, they are more likely to be sentenced to prison than non-Aboriginal people. This

overrepresentation is growing. In 1995–96, Aboriginal people made up 16% of all those sentenced to custody. By 2011–12, that number had grown to 28% of all admissions to sentenced custody, even though Aboriginal people make up only 4% of the Canadian adult population. The over-incarceration of women is even more disproportionate: in 2011–12, 43% of admissions of women to sentenced custody were Aboriginal. Aboriginal girls make up 49% of the youth admitted to custody, and Aboriginal boys are 36% of those admitted to custody.” (p. 110)

- Infant mortality: “The infant mortality rates for First Nations and Inuit children range from 1.7 to over 4 times the non-Aboriginal rate.” (p. 108)
- Victimization by crime: “Aboriginal people are 58% more likely than non-Aboriginal people to be the victims of crime.” (p. 110)

There is a title in one of the documents (TRC, 2015a) that makes explicit reference to trends: “Measuring Progress” (2015a, p. 208). However, this is an ironic title as the section opens with a complaint about the impossibility of measuring in the absence of good statistical data.

Obtaining precise information on the state of health of Aboriginal people in Canada is difficult. The most complete information about comparative health outcomes is out of date, much of it coming from the 1990s. Unlike in other countries, the Canadian government has not provided a comprehensive list of well-being indicators comparing Aboriginal and non-Aboriginal populations. The lack of accessible data on comparable health indicators means that these issues receive less public, media, and political attention.

Zooming out

Throughout the document, numbers are used for developing arguments and statements as we have shown through examples above. However, zooming out and viewing the document as a whole it becomes apparent that numbers are used more often, and with different purposes in some parts of the documents than in others. In the Introduction chapter, the section called “Commission Activities” uses numbers for presenting summaries/making accounts for and of

the Commission's work as amounts of money, people, interviews, events, etc. These numbers are mostly specific.

In the history chapter of TRC (2015a) the section focusing on food and diets, called "Food: 'Always hungry'" (p. 88) and on discipline, called "Discipline: 'Too suggestive of the old system of flogging criminals'" (p. 103) have a lower rate of reference to numbers than we expected. On the other hand, the chapter on health, labelled "Health: 'For sickness, conditions at this school are nothing less than criminal'" (p. 92), is very rich in graphs and numbers with less text and narratives. This section also has the greatest number of specific numbers and graphs. We wonder if numbers and graphs in this section are used to hide strong emotions. We ask ourselves why more specific numbers are used in some sections than in others, but we would have to speculate to answer the question. There are almost no specific numbers in the legacy goals—"Calls to action"—and the specific numbers are even more rare in the chapter on apologies.

Discussion

In this article, we wanted to illustrate how numbers might (not) be used in documents that address important and painful history (which continues into the present). We showed examples from the TRC reporting (TRC, 2015a and 2015b), in which numbers are presented as specific and vague, and how these choices mask or highlight individual identities and show trends. These choices of how to present numbers colour the history Canadian people know, and thus influence the imagined future in Canada.

We want to inspire mathematics educators, both Indigenous and non-Indigenous, to recognise possibilities for working critically with numbers. However, we want to underline that caution needs to be taken with respect for cultures, people, and spaces when working critically (and mathematically) with ethically rich documents. Hence, we encourage researchers, teachers, and teacher educators to think carefully about what ethically rich

documents are available in their specific regions and how these documents might be used in a culturally caring way. Questions to consider before teaching this kind of critical mathematics include: how do the suggestions raised in this article resonate with you and your students' (deep cultural) values when teaching mathematics, and how might the suggestions be adjusted and adapted to your specific context? Further questions include:

- What right/responsibility do non-Indigenous people have to address a history of colonization in your region?
- What language is used to describe Indigenous and non-Indigenous people, and what is the impact of these choices in your work? (e.g. 'settler,' 'colonialist')

In this article, we highlighted the ethical choices involved in choosing numbers and choosing how to present them in two ethically rich documents. Thus, we close with some questions that we came to ask when working with the TRC documents, which are questions that we encourage mathematics educators and teacher educators to raise with students in the examination of ethically rich documents:

- Where are the numbers? Where are they not?
- How are the numbers represented?
 - Are they specific or vague?
 - Are they rounded? Are they absolute numbers or proportions?
 - If they are proportions, what is being compared?
- How are graphs used? Or not?

- Why do you think the authors chose to use numbers, graphs, or other forms of representation as they have done? What do their choices prompt readers see and not see?
- What if not? Consider different ways of reporting on the same phenomena. What would be the effects of these representations? (This may require investigative research to find missing data.)

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