Application - Insight Development Grants

Identification

Applicant

Family Name: Kim

First Name: Mijung

Middle Names:

Current Position: Associate professor

Primary Affiliation: University of Alberta

Department/Division: Elementary Education/Faculty of Education

Application

Application Title Science and Mathematics textbook writers' hopes for peace and sustainability

Research group 5 - Education, psychology and related fields

Multidisciplinary evaluation (required) ◯ Yes ◉ No

Joint or special initiative Select

Is this a research-creation project? ◯ Yes ◉ No

Does your proposal involve Aboriginal Research as defined by SSHRC? ◯ Yes ◉ No

Scholar Type

Are you an Emerging Scholar or Established Scholar? Established

Confirmed Scholar Type   Established

Science and Mathematics Textbook Authors' Hopes for Peace and Sustainability

1. Objectives:

It is hard to imagine educators who do not claim to be working for peace or sustainable development, yet peace and sustainability interests are not very prominent in school textbooks, especially in science and mathematics textbooks. Why do textbooks avoid these important goals for human coexistence and our environment? This question motivates our interest in the tensions textbook authors experience in relation to their hopes for peace and sustainability—in particular, the resistance they experience in relation to their hopes for society and for the children who use their textbooks.

In May 2016, we were part of a team of 33 educators from 14 countries invited to Bengaluru, India by UNESCO's Mahatma Gandhi Institute of Education for Peace and Sustainable Development (MGIEP) to begin work on a guidebook for curriculum writers to embed concepts of peace, sustainable development and global citizenship into textbooks for mainstream subjects. This assemblage of teachers, textbook publishers, non-government organization personnel, and education researchers covering the subject areas of science, mathematics, language arts and geography was based on the participants' international reputations relating to peace and sustainability in education. The conversation among this group inspired our research interest into the way textbook authors reconcile personal, disciplinary and societal demands into their writing.

Our overarching goal is to better understand how textbook authors reconcile the competing demands of their disciplines, the relevant school discourses and societal and environmental needs. We will do this by gathering narratives of their writing experiences, and comparing these across disciplines and international contexts. To achieve our goal, we need to develop familiarity with the relevant literature and fine-tune our methodologies. Thus in this proposal, we will focus on the disciplines we know best in the contexts we know best— science and mathematics teaching in Canadian schools. These disciplines are especially ripe for the analyses we propose because these are the school subjects most closely associated with objectivity, which may seem at odds with hopes for peaceful human relationships and for the environment. This proposal will lay the groundwork for a full Insight Grant proposal, and will establish contacts with potential research participants in this wider and more ambitious project.

In this Insight Development Grant, we propose to examine how textbook authors position themselves in relation to their hopes and challenges. In particular, we are interested in how the material they write might be a force or influence relating to their hopes (and challenges), especially in relation to peace and sustainability. To focus this question, we will ask Canadian science and mathematics textbook authors:

1. What are your hopes for students, for society and for the environment?
2. What challenges will students face in terms of these hopes?
3. How do your hopes appear in the text you write as an author?
4. What challenges and insights have you experienced while trying to integrate your hopes into your writing?

After addressing these relatively open questions, we will draw participants' attention to the sustainable development goals (SDGs) developed by the United Nations (https://sustainabledevelopment.un.org/sdgs) to further prompt them to relate how they think about these universal and almost universally-accepted goals. The narratives drawn out by question 4 will position the participants' conceptualizations of hope and their ways of navigating the weave of society's and others' hopes all in relation to the authors' stories—their experiences as students, educators, parents, consumers, and other identities including gender and ethnic.

2. Research Context

Considering that textbooks have been largely unchanged over the years, we realize that there are strong disciplinary forces at work that maintain the shape and content of the texts. These forces include the school disciplines (science, mathematics, etc.) and other school discourses. We hope that a focus on the experiences of textbook authors in reconciling these discourses in relation to their social and environmental goals will help us to better understand school disciplines and discourses. This focus will enable us to collect descriptions of practices for reconciling the discourses, which would be illuminating

for textbook authors and other education professionals. Thus, we centre our research on the experiences of authors in relation to their hopes, and to the resistance they feel in realizing these hopes. In order to understand the hopes of textbook authors, it is important to understand what we mean by hope.

…..Hope: The word 'hope' is used in a variety of ways, usually with a relatively vague meaning. One can speak of a general sense of hope, which might be described as either optimism or an attitude of resilience in the face of challenges. This sense of hope is common in religious traditions, as these traditions provide a way of living with tragedy. Alternatively, 'hope' can refer to specific and distinct goals or wishes, which could be dependent on luck or on planning and effort. Such hopes are usually in reference to the wishes of a particular person. This specific sense of hope features strongly in psychology literature (e.g., Idan & Margalit, 2013; Synder, 2002); hope is seen as goal-oriented energy and pathway planning to meet specific goals and it is highly motivational to bring desirable changes into one's life and society (Snyder, Rand, & Sigmon, 2002). This goal-seeking may extend beyond the individual, because one's vision for the future necessarily involves wished-for relational situations (Ludema, 2000; Tiger, 1999). Psychology research often measures hope (Douglas & Strobel. 2015) and identifies its correlates (Adelabu,2008; Chang & Banks, 2007)—hope as a contributing factor in other endeavours or hope as a product of other factors (Hughes, 2011; Palaiologou & Male, 2016).

We are more interested in collective hopes, which relate most closely to Freire's (1994) articulation of hope: it is ontological, but rooted in practice for "there is no hope in sheer hopefulness" (p. 9). This sense of hope requires a sense of optimism and resilience because our individual efforts to develop and support a peaceful and sustainable future cannot be realized by our efforts alone (Peters, Grégoire, & Hittleman, 2004; Shade, 2006). We have to act with the optimism that others too will act with these goals in mind. Sartre (1996) noted that hope is essential for action because "I can't undertake an action without expecting that I am going to complete it" (p. 56), but collective hopes defy this stance. One may undertake an action knowing full well it will fail without concerted action. This is why we favour Rorty's (1999) conception of romantic hope, in which it is a "shared utopian dream" and Halpin's (2003) characterization of hope as a radical intersubjectivity, a willingness and sense of responsibility to bring people together in empowerment and collective agency (Halpin, 2003). We think Freire's sense of practical optimism, along with Rorty's and Halpin's realization that such hope requires a collective leap allowing for the articulation of particular and specific hopes that can be discussed in relation to practice. A synonym of *hope* is *aspiration*, which has the Latin root *spiritus*. This is the word for spirit and for breath. Hope is the heart of one's living being. The kind of hope we see as a necessity for educating for peace and sustainability would have educators *con-spire*, to breath together, sharing the same spirit and vision. When educators conspire in this way, our individual actions may join together to make societal and environmental goals possible.

The kind of hopes we expect participant authors to identify are likely to align with the United Nations' Sustainable Development Goals (SDGs), which we summarize as follows: no poverty, good health and well-being, quality education, equality, sustainable practices for economic development and action, responsible climate action, peace and justice, and partnerships that support all these goals. We expect them to realize that we live in a complex system that pits these goals in tension with each other in many ways. Thus we expect our research will help us to understand the complex systems at play and to see these in relation to school disciplines and discourses.

We also think our research will help us to understand hope better. We do not wish to duplicate or challenge the work of the well-known (e.g., Freire, 1994; hooks, 2003) and other scholars (e.g., Webb, 2010), who have theorized hope in powerful ways, but we are interested in how educators operationalize their hopes into their everyday pedagogical decision-making and actions. These ways of working with hopes and challenges may be described as pedagogies of hope. We will be able to compare these pedagogies of hope to other visionary pedagogies of hope. For example, both Paulo Freire (1994) and Bell Hooks (2003) have written books with 'pedagogy of hope' in the title. In the discourse of peace and sustainability education, the literature repeatedly emphasizes notions of enlightenment, empowerment, self- and collective-responsibility and activism to transform school curricula and current educational practices (Bonnett, 2013; Kopnina, 2014). Yet, despite the long-term effort of bringing peace and sustainability into the mainstream discourse of society, culture, and education, its progress has been

unsatisfactory. This has resulted in feelings of despair, exhaustion, fear, doubt, uncertainty, and failure around the discourse of peace and sustainability education. This despair and exhaustion motivates our research.

Hope as a vital part of educational planning has not been examined sufficiently in educational discourse. We expected (hoped) to find literature on the hopes of teachers (and perhaps other educational practitioners) as social agents. How do they think about and embody the notion of hope in their everyday tasks? Alas, we have not found such literature. There is psychology-oriented research that examines teachers' professional goals, but we have not found research on the kind of hope we envision at the heart of educating for peace and sustainable development.

…..Textbook authorship: While we expected to find research on the hopes of teachers and how these hopes guide their professional action, we did not expect to find such research on the professional work of textbook authors. Indeed, research on mathematics and science textbooks rarely focuses on authorship in any way. However, research that characterizes the content and/or language of textbooks can set a useful baseline for our research because we might infer the hopes of authors based on the evidence in their texts. A focus on the actions a textbook promotes could be seen as a window into the social fabric that authors envision in relation to their hopes. However, such a document analysis foregrounds the results of authors' struggles to reconcile conflicting discourses, and gives little insight into their processes and reflections.

We caution that the agency of authors is complex, as they write within a system of discourses in which we expect to find authors seeing themselves as representatives of others, including their publishers, their disciplines (e.g., mathematics, or science) and the teachers in their discipline. They are writing to, and for, these people. It is natural to address a complex discipline by continuing in its traditions and thus, we conjecture, repressing one's own hopes and vision in favour of the implicit hopes and vision inscribed in the discourse. "Writing is that neutral, composite, oblique space where our subject slips away, the negative where all identity is lost, starting with the very identity of the body writing" (Barthes, 1968/1977, p. 142).

The literature on authorship tends to focus on writing fiction. Nevertheless, we think this focus is informative for understanding the position of textbook authors. In her musings about authorship, acclaimed Canadian novelist Margaret Atwood (2002) asked, "For whom does the writer write?" (p. 126) and concluded that any writer writes for the reader—"For the reader who is not Them, but You. For the Dear Reader. For the ideal reader" (p. 151). One can write for someone or to escape writing to someone, in which case the audience is still the motivating force (to approach or to escape). This reflects the Barthes' (1968/1977) quote above, from his essay "The Death of the Author." While Atwood and Barthes foreground the reader to counter the prevailing focus on authors, we see reader and author having agency together. Eco's (1994) theorization of the relationship between author and reader helps. He described how texts create a "model reader—a sort of ideal type, whom the text not only foresees as a collaborator, but also tries to create" (p. 9). The text addresses the needs of a real reader enough to transform him or her into the reader imagined by the text. It is the text, and not the author, that imagines and addresses the reader, because a text constructs a model reader regardless of the author's intent. This helps explain the constraints a textbook author may feel.

Eco's (1979) theorization also helps us identify kinds of text, which may reflect an author's vision (in complicity/conspiracy with the discourses at play in the textbook discourse). A *closed text* imagines and constructs a single reader. It recognizes only one interpretation. By contrast, in an *open text* "the author offers […] the addressee a work *to be completed*" (p. 62). The text invites the reader to choose from a variety of interpretations. Eco's closed and open texts relate to Bakhtin's (1975/1981) notions of unitary language and heteroglossia, respectively. Bakhtin described how unitary language acts like centripetal force by pulling meaning to a unified centre, while heteroglossia acts like centrifugal force by pushing out from shared meaning to say something new. While Eco and others (e.g., the research tradition of appraisal linguistics) have evaluated text as either open or closed, Bakhtin explained how both forces are always present.

Kuhn (1970) saw science textbooks as conservative exemplars of disciplinary paradigms. Kuhn's recognition of the conservative nature of textbooks, and how they present the least controversial aspects

of a discipline, reflects back on the tradition of textbooks, but this characteristic of textbooks continues to carry forward into the present. Hyland (2000) described textbooks as a conservative force promoting "tamed and accepted theories of a discipline" (p. 105), a canonizing discourse. By contrast, open texts invite readers to explore a variety of perspectives and equip them to confront systems challenges such as the UN's SDGs. A Bakhtinian question in this context is this: how can a text be both within a disciplinary tradition and at the same time push at its boundaries? However, this is not our research question. The guidebook we are involved in writing addresses this question. Rather, our research plan addresses how textbook authors navigate this tension in science and mathematics education.

.....**Science and mathematics textbooks**: Science textbooks continue to be considered the main instructional tool (DiGiuseppe, 2014; Kelly, 2007); for instance, 75%–90% of instruction and 90% of all teacher-assigned homework are based on textbooks (Chambliss & Calfee, 1998; Chiappetta, Ganesh, Lee, & Phillips, 2006). Research has also reported problems in textbooks such as poor projections of the nature of science, narrow worldviews in scientific knowledge (McTigue & Slough, 2010) and obfuscation of human agency in environmental problems (Sharma & Buxton, 2015). With this, there has been much demand on textbook authors' and producers' awareness of ongoing challenges in science textbooks, yet textbook authors' voices, hopes, and challenges in writing textbooks for children's and societal development remain largely hidden in educational discourse. In recent research into science textbooks, it was evident that textbook authors are much more likely to impact the content of textbooks, including the views of science and technology in society and their future impact (Abd-El Khalick et al., 2008; DiGiuseppe, 2014).

Research on mathematics textbooks generally focuses on content analysis—comparing the content in different contexts (e.g., Charalambous, Delaney, Hsu, & Mesa, 2010), comparing content against a prescribed curriculum, which is referred to as fidelity (e.g., Polikoff, 2015; Sidenvall, Lithner, & Jäder, 2015), or evaluating the depth or level of content on a particular focus area (e.g., Davis & Fonger, 2015). There are also discourse analyses that, for example, identify gender constructions (e.g., Hottinger, 2010), and features of grammar that indicate aspects of mathematics and mathematics education discourse (e.g., O'Keeffe & O'Donoghue, 2015; Herbel-Eisenmann & Wagner, 2007). Further, there are studies of how textbooks are used—by teachers (e.g., Son, & Kim, 2015; Taylor, 2013), and by students (e.g., Weinberg & Wiesner, 2011). The only contribution we could find in the literature addressing the experience of a mathematics textbook author is one by Wagner (2012), which comprises an author's reflection on the challenges of writing text that opens up multiple perspectives. Even this reflection is a form of discourse analysis as it scrutinizes examples from the texts, and it says nothing about the textbook author's challenge of reconciling discourses. Questions on tension and dissonance of textbook authors' hopes with disciplinary, and other social demands in textbook writing are clearly lacking in existing research. We hope that this study will be a starting point for us to understand the lack of peace and sustainability education in school practice.

3. Methodology

Our research is qualitative, informed by narrative storytelling. The complex nature of human experiences can be shared and understood in the form of storytelling. Narrative stories are one's voices, relationships, and reflections on experiences, which provide us social and cultural contexts of one's being and positioning in the community (Clandinin & Connelly, 2000; Miller, 2009). The meaning of one's experiences becomes explicit in, and through, stories and constitutes who we are in the experiences (Gill & Goodson, 2011). To understand lived experiences and the hopes of textbook authors, we adapt the tradition of narrative storytelling as a research method. Narrative storytelling is a way of understanding human experiences in a collaborative manner of sharing and communicating between researcher and participants in social interactions. We, as inquirers, strive to enter in the matrix of personal and social contexts of textbook authors' stories to construct and *re*construct the meanings of "stories lived and told" in textbook writing (Clandinin & Connelly, 2000, p. 20). From their stories, we strive to understand how they are positioned in the action of textbook writing as educator, author, and communicator and how they experience the cognitive dissonance among curriculum, prevailing education discourses, professional knowledge and personal hopes for peace and sustainability. While the grand narratives of

curriculum and textbooks are positivist and Eurocentric, with standardization and competition, our approach of narrative storytelling invites interpretive and relational understandings of texts through stories lived and told by textbook authors. We strive to understand their worldviews, hopes, and fears for students, society and their environment and to understand their positioning as educational agents in textbook writing experiences.

We will invite textbook authors to share their stories of textbook authoring. To set the stage, we will invite them to share their experiences and challenges of textbook writing and their hopes and fears in relation to peace and sustainability. We will follow this with an elicitation of narratives of their attempts to address these hopes and fears, reflecting back on their own experiences of textbook authoring. In order to prod participants to explore the depths of their hopes, we will engage them further in dialogue about the UN SDGs, to see if they would elaborate on their narratives in terms of the hopes they share with representatives from around the world.

Our proposed research process consists of two storytelling interviews, and consultations with two experts on textbook research and international peace and sustainability education.

1. Sept 2017: We will contact textbook authors in Science and Mathematics in Canada, aiming for a range of levels addressed. We will work with six participants.
2. Oct – Dec 2017: First storytelling interview: we will conduct face to face interviews to ask about authors' lived experiences of writing in relation to their hopes and fears for students and society.
3. Jan 2018: We will work with the participants' narratives to identify themes and highlights. At this time, we will check back with them via video conferencing to clarify meanings and elaborate on their narratives as warranted.
4. Feb – Mar 2018: We will share the interview stories in their processed form with our two collaborators to get feedback on our interpretations, particularly what questions are prompted from their knowledge of textbooks in other (international) contexts.
5. Apr 2018: Second storytelling interview: We will share our initial syntheses of each participant's narratives with them, ask for elaboration based on the feedback from our collaborators, and invite further narratives reflecting their hopes in relation to the UN SDGs.

Textbook authors' stories will be contextualized in stories of hope in, and for, education. Their stories are hidden and unrecognized in educational contexts, but are critical to understanding the complexity of current educational challenges and questions about the grand narrative of curriculum in peace and sustainability in education. Based on the three dimensional space-narrative structure (Clandinin & Connelly, 2000; Ollerenshaw & Creswell, 2002), we look into their hopes for peace and sustainability as humans and textbook authors (Interaction), hopes in previous and future textbook authorship (Continuity), and hopes situated in the complexity of curriculum, textbook guidelines and social changes (Situation).

…..Next steps: As stated above, it is our intention is to use this initial project to inform our envisioned larger project, which will span more disciplines and educational contexts. The larger project will allow for comparisons and contrasts relating to disciplinary and cultural diversity, while also entering into a deep understanding of individual experiences of hope and action.

- We will continue the approach used in this initial project with a wider range of interviewees (across international contexts and more disciplines).
- We will compare participants' hopes to the United Nations' sustainable development goals and to textbook content analyses relating to these goals.
- We will further theorize the notion of educating with hope in peace and sustainability education based on textbook authors' stories. Instead of seeing hope as an ideal, we expect to see a range of hopes and ways of thinking about hope in different individuals. We will ask:
  - From where do people get their hopes?
  - How does the experience of engaging one's hopes in writing change these hopes?
  - What are the tensions and dissonances of personal, disciplinary and social demands in textbook writing?

Timeline

Sept 2017 – December 2017
1. *Mock interview with the co-PI*: The PI and RA will conduct a mock interview with co-PI as one of the former Math textbook writers. This will help the team understand the nature of narrative interviews and develop interview strategies.
2. *The first interviews with textbook writers*: The research team will contact science and mathematics textbook writers who wrote the current textbooks in Canada. We will have 6 participants and already have potential interviewees in BC and Ontario. The team will contact them and share the purpose of the research and research methods and decide interview schedules together with interested participants. The first round of interviews will take place by the end of Dec 2017 and will consist of 6 face to face meetings, three with science textbook authors and three with math textbook authors. We will pursue face to face meeting for the 1st interview to develop comfort and trust levels with the participants and also capture their emotional expressions and body languages during storytelling on video recording. We expect that they will not be accustomed to talking about their intimate hopes in relation to their work.
3. *Training on Narrative methods*: Throughout the study, the RA, together with PI will participate the research seminars, which focuses on the discourse of qualitative research and narrative storytelling.

January 2018– April 2018
1. *Data interpretation of the first interviews*: The research team will conduct data analysis of the first interview data and prepare the second round of interviews. By reviewing literature on hope theory, the team will develop the framework of data analysis. Follow-up interviews via Skype will take place as necessary.
2. *Feedbacks on data interpretation and further direction:* In Feb-March 2018, the two collaborators (Yoko Mochizuki, Eleni Christodoulou) will provide feedback on our interpretations and on what might be asked further in terms of peace and sustainability education through textbook writing.
3. *The second interviews*: This will take place by the end of April, 2018. During this time, we broaden their experiences and challenges of textbook writing for peace and sustainability education in relation to well-established universal goals as articulated in the UN Sustainability Development Goals. This interview will be processed via Skype, as we will have already established a relationship of trust with participants. We will record the Skype interviews to understand participants' bodily positions and expressions.

May– August 2018
1. *Data interpretation of the second interviews*: Data analysis on the second set of interview data will take place. Further follow-up interviews via Skype will take place if necessary.
2. Writing research reports will start based on analysis of the 1st and 2nd sets of interview data.
3. The team write conference proposals based on research findings (EECOM conference).
4. The team with in-kind tech support will start to develop videos & online materials to share findings.

September –Dec 2018
1. The PI, co-PI, and RA will contact the two collaborators to share data analysis and findings.
2. The team submit journal articles and/or book chapters to publishers.
3. The team will present their work at seminars at various research centres at UAlberta and UNB.
4. The team attends the Canadian Network for Environmental Education and Communication (EECOM) Conference for further knowledge mobilization at the national level (Oct 18-21, 2018)
5. The team will organize with workshops with textbook writers, publishers, teachers, and curriculum developers in the province to share research findings and complete videos & online materials for knowledge mobilization.

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