

Piloting Historical Thinking Lessons to Address Climate Change

Heather E. McGregor

Sara Karn

Rebecca S. Evans

Queen's University

Jackson Pind

Trent University

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ABSTRACT

To demonstrate how the history classroom could become an important site for addressing climate change, this article describes the piloting of three lessons. Our qualitative case study occurred in an elective environmental education course with teacher candidates who participated in the lessons and were invited to provide feedback. We describe the lessons and their development, and share results from surveys and an interview. Participants identified several educational benefits and expressed feeling better prepared to teach both history and critical thinking in general. Our findings suggest that these lessons may serve as useful examples for developing new resources to support educators in teaching climate change alongside critical and historical thinking.

KEYWORDS

critical thinking; historical thinking; social studies and history education; environmental education; climate change

Introduction

In Ontario, where we are located, all educators—regardless of their subject expertise—are called by provincial policy to act as “environmental educators,” but supports have never met the needs to achieve this policy goal (Chowdhury, 2015; Pardy, 2010; Pedretti et al., 2012; Puk & Behm, 2003; Tan & Pedretti, 2010). Researchers and teachers around the world are producing a growing number of resources specifically intended to support environmental and climate change education,¹ but few seem to view history classrooms as an important venue for their work (these exceptions include: Audigier, 2021; MacEachern & Turkel, 2009; Macfarlane, 2021; Oosthoek, 2011; Schwartz, 2011; Wakild & Berry, 2018). Rather, geography and biology classrooms appear to remain the standard places in which to study environmental relationships and changes. While we believe the conceptual vocabulary and disciplinary practices of subject areas like geography are crucial to environmental programming, our aim is to expand the “tent” of educators who see themselves as engaged in promoting interdisciplinary environmental studies, ecocentrism, and climate response. As history educators ourselves, we are taking our own first steps in this direction by using the tools and approaches that are familiar to new and practising history teachers, so that they may see a place for themselves to enter and explore the “tent” that is cross-curricular environmental education (see also McGregor et al, 2021). At the same time, we do not uncritically endorse all that is familiar about the way that history has been and is taught in Canada, and a great deal of change is necessary in teaching that takes the climate crisis seriously—but that larger discussion is beyond the scope of this inquiry.

We have formed the *Social Studies and History Education in the Anthropocene Network* (SSHEAN), seeking to demonstrate how educators may reimagine social studies and history education to address climate change and associated ecological, economic, and social challenges.² SSHEAN’s knowledge mobilization goals include the development and dissemination of resources for teacher candidates, practicing teachers, and teacher educators, with adaptable exemplars for teaching history in the Anthropocene—the epoch in which humans are the dominant influence on Earth (Lewis & Maslin, 2015; Malhi, 2017). As part of this goal, we developed three lessons on history and environmental topics that center climate with the intent of pursuing a range of learning outcomes alongside critical and historical thinking. The lessons, described in more detail below, are named “The ‘Golden Spike,’” “*Angry Inuk*,” and “Misinformation, Past and Present.”³

In this article, we share details about these lessons and how teacher candidates responded to them in a pilot study conducted in an elective environmental education course in the Faculty of Education at Queen’s University. We begin with a discussion of the intentions that informed our lesson development process. We then explain the pilot study, study participants, data collection and analysis methods. Finally, we outline each of the lessons and summarize how teacher candidates engaged with them. Through sharing our process and study, we invite history educators to consider adapting the lessons for their own classes and to consider using them as examples to create more lessons. We suggest that lessons bridging history and climate change can deepen critical thinking skills and invite students to envision new, ecocentric pathways, as they consider past, present, and future human dependency on, and relations with, the environment.

Developing Lessons

We believe history classrooms are an important venue for learning about environmental topics and climate crisis, and we developed three lessons to address the need for more resources to support such learning. The lessons are intended to be clearly recognizable as history lessons, although learning outcomes relevant to other subject areas are also present in each of them. These lessons were originally developed for

¹ For example, see *An Existential Toolkit for Climate Justice Educators*, <https://www.existentia toolkit.com/>.

² View educational resources and connect with SSHEAN by visiting the website <https://sshean.ca/>.

³ View each of these three lessons and the accompanying materials on the SSHEAN website <https://sshean.ca/resources/>.

an audience of teacher candidates, in order to model critical and historical thinking lesson plan development. However, they can be easily modified for different age groups and subject areas within K-12 and postsecondary education, as well as in non-formal educational settings.

Our lessons are inspired by the Critical Thinking Consortium (TC²) approach to lesson design and critical challenges (Case & Daniels, 2016). They all include:

- a central critical thinking question;
- the definitions for, scaffolding of, and opportunities to apply critical thinking vocabulary and concepts; and,
- at least one activity that presents students with several plausible outcomes, and the criteria to be used in reasoning or coming to a judgment.

Each lesson was designed to stand alone, and to limit the amount of background information required for students to participate. We did not design the three lessons to be delivered in a particular sequence, or to build upon one another. They are intended to show three distinctly different exemplars of critical and historical thinking lessons that can be adapted for multiple levels and audiences, with the idea that different approaches and topics will appeal to different teacher candidates or practising teachers and, thereby, become a vehicle for recognizing that historical engagement has an important place in any student's environmental education.

Historical thinking concepts are also clearly embedded in each of the lessons, with a particular focus on evidence, historical significance, and historical perspectives. Our understanding of these concepts and how they can be taken up in the classroom is informed by Peter Seixas's framework of historical thinking (Seixas, 2017; Seixas & Morton, 2013), and extended by some of our own work on historical consciousness, positionality, narrative, historical empathy, and the affective dimensions of learning about the past (Karn, 2021, in press; McGregor, 2017, 2018). We recognize that there is an ongoing conversation in the history education research community about the relationship between the historical thinking movement and decolonizing imperatives for history education (Cutrara, 2018; Gibson & Case, 2019; Marker, 2011; McGregor, 2017; Miles, 2018; Seixas, 2012). This includes whether the imposition of the former inherently inhibits the latter, and important contestations as to how historical thinking concepts are 1) understood, 2) taught, and 3) whether they advance or limit the goals of schooling that should supersede the goals of the source discipline—academic history—such as citizenship education outcomes. However, recognizing that historical thinking is currently one salient and predominant, if contested, system by which students are asked to actively and critically examine the past in existing curriculum, our approach here is to build and extend from the system, with attention to its affordances and limitations. The lessons also offer concrete ideas that address the suggestions for history teaching and learning practice we previously outlined (McGregor, Pind, & Karn, 2021), while aiming to help history and social studies educators confront the climate crisis.

Methods

For this study, we employed a qualitative case study design to learn about teacher candidates' experiences with, and perspectives on, the lessons. The three lessons were piloted in an elective environmental education concentration class of thirty teacher candidates in the Faculty of Education at Queen's University. The teacher candidates included those preparing to teach across grades K-12 and in a wide range of subjects.

With approval from Queen's University Research Ethics Board, following each lesson, all teacher candidates were invited to participate in surveys (one for each lesson), as well as a focus group discussion. The instructor of record, Heather McGregor, left the room during the research activities so as to limit any perception of conflict of interest, and a research assistant, Rebecca Evans, who had no role in assessing candidates' performance in the course, facilitated the research activities. When possible, scheduled class time was offered to participate in the research so that it would not cut into candidates' free time or other scheduled

activities. The methods were intended to determine the effectiveness of the lessons and understand their educational benefits from the teacher candidates' dual perspectives as students and prospective teachers. While environmental content is clearly present in each of the lessons, our interest in this research was to determine how well the lessons facilitated teaching critical and historical thinking about environmental topics, rather than how well the lessons conveyed specific environmental content. The surveys were constituted by a series of closed- and open-ended questions wherein teacher candidates shared their experiences engaging with the lessons, the emotions elicited by their learning, as well as their considerations for how they might adapt the lessons to suit different teaching contexts. The focus group was intended to offer an opportunity for participants to build on their responses, comment on the impact of the three lessons in succession, and share their experiences in a more in-depth way.

Fewer teacher candidates volunteered to participate in the research than we anticipated: survey one $n=12$, survey two $n=7$, survey three $n=4$, and focus group $n=1$ (therefore, we refer to the focus group henceforth as an "interview"). The majority of participants held an undergraduate degree in science, while fewer held a degree in the arts and humanities. Only one participant held an undergraduate degree in history. With respect to the limited amount of data, the three lessons were piloted during a period of the pandemic when classes changed suddenly from in person (Lesson 1) to online (Lessons 2 and 3). The sudden change placed an extra level of burden on teacher candidates who were navigating the intensive program (the B.Ed. program at Queen's University is scheduled over 16 consecutive months which means that students are in courses very close to the December holiday break), while also managing their own wellness during a wave of COVID-19. The return to instruction on Zoom was deflating and discouraging for many, and participation in course activities overall was impacted at this time. Given that only one student volunteered for the focus group, it became an interview. We did not know until the focus group began that only one individual would attend, therefore we did not amend the questions, which were conceptualized to support a focus group. In the end, the questions worked well for an interview format as well. In quoting from participants here we do not distinguish which data came from a survey and which came from the interview, given that few individuals were involved. As a result, the study provides insight into a relatively small number of participants' experiences with the lessons, and we hope to conduct further research to extend these findings. Further, the academic backgrounds of the teacher candidate group from which participants were recruited was beyond our control in this teaching scenario. Ideally, we would have invited more participants with a history undergraduate degree, alongside those who may be teaching history without that disciplinary background.

Data was analyzed using a general inductive approach (Bryman & Burgess, 1994), where data was coded using the In Vivo coding method (Saldana, 2013). In Vivo coding was most appropriate because it drew codes directly from the participants' language, rather than drawing on a priori codes (Saldana, 2013). The codes were then analyzed for prevalent themes. In the sections that follow, we discuss each lesson and the development process before highlighting how teacher candidates responded to the lessons.

Lesson 1: "The 'Golden Spike'"

The first lesson, "The 'Golden Spike'," was developed based on our thinking about teaching in the Anthropocene, the implications of periodization associated with the Anthropocene, and how the debates over when the Anthropocene began affect the way we understand ourselves in the world now (Kramer & Oliveira, 2021; Malhi, 2017).⁴ It was also informed by our observations that teachers like activities where students are given a list of moments in time and asked to reason about which ones are most significant and why.⁵ "The 'Golden Spike'" invites students to contribute to ongoing debates among scientists and other researchers over the question, "When did the Anthropocene begin?" Students are provided with some background on

⁴ We are aware that geologists have not yet officially designated this epoch as the Anthropocene, and also that there is even less cultural consensus about the term. However, as the "Anthropocene" is increasingly ubiquitous in public discourse we view it as relevant for students to be prepared to engage with the term critically.

⁵ For example, refer to the *Snapshots in Time: Significant Events in Canadian*

History resource: <https://tc2.ca/shop/snapshots-time-significant-events-canadian-history-p-2175>.

how geologists use markers known as “golden spikes” to mark an event in stratigraphic material, such as rock, sediment, or glacier ice, which provides evidence of indelible changes to the Earth.

In the classroom activity, students work in groups to examine the provided materials, including an interactive timeline, images, graphs, and text, to learn more about the different dates that have been suggested as markers for the beginning of the Anthropocene. The major time periods introduced as the potential start of the Anthropocene include: the First Human Use of Fire (1.8 million years ago), the Agricultural Revolution (7-8 thousand years ago), Colonization (circa 1610), Industrialization (circa 1800), and the Great Acceleration (Mid-20th century). From the field of geology, students consider the criteria for a Global Stratotype Section and Point (i.e., a physical marker of a geological event in stratigraphic material), as well as criteria used in history education to evaluate the historical significance of an event, person, place, or thing (e.g., depth of change, pace of change, longevity of change, variety of change, number of people or beings affected).

Students use the criteria to develop an argument about when the Anthropocene began. As they develop their arguments and listen to those of their classmates, they may begin to think about how their own values and assumptions shape their beliefs about the Anthropocene. A suggested discussion question at the end of the lesson is to consider if, and why, it is even necessary to choose a single date. The lesson ends with students presenting their case on why their chosen date is most appropriate to mark the start of the Anthropocene, based on the evidence gleaned from the resources. For teachers looking to extend the lesson outside of the classroom, we also designed an outdoor extension which allows students to look for evidence of each ‘golden spike’ in their local environments.⁶

In their survey responses to this lesson, teacher candidates reported that the group deliberations over the periodization possibilities were very effective at engaging them to think critically about the past and consider more deeply what the Anthropocene means. For example, one participant shared that picking a date “...allows students to think critically and determine what our most significant impact is on the environment. We can’t begin to solve a problem until we accept it and understand where we went wrong in the first place.” All survey respondents indicated that they had learned about climate change prior to the class, while only some were familiar with the historical dimensions of the Anthropocene. Most respondents had little or no experience learning about the history of the Anthropocene prior to the lesson and saw value in looking at climate change through a historical lens. Despite the different degrees of prior knowledge, teacher candidates indicated that they found the discussion and presentation of arguments beneficial to informing their own critical thinking about other peoples’ perspectives. One teacher candidate captured this sentiment well in their response: “I like the idea of group work and having different groups present different topics or ideas. Having students develop their own thoughts and ideas and present them rather than just hearing the teacher speak.” Another commented, “I think framing the lesson in a debate format added humour and engagement.” It should be noted that the exchange of ideas was not through a traditional debate format, but rather a series of persuasive presentations about their claim(s) as to when the period began. Nevertheless, it is clear the participants enjoyed thinking about the evidence and criteria with their peers and presenting their arguments in engaging ways. Most mentioned the value of working together with others to assess evidence and develop a position, highlighting the benefits of talking through their ideas with their peers. While the positive feedback about this type of activity may not have a great deal to do with the topic of the Anthropocene specifically, it is an important consideration in the modeling we were aiming towards in utilizing this particular form of critical thinking. Working with peers to utilize criteria in considering several plausible alternatives led to learning and discussion that participants perceived as meaningful.

As a result of this lesson, many teacher candidates were able to identify a period of time that they thought should be named the start of the Anthropocene (regardless of what their own group had argued for),

⁶ Refer to the outdoor extension lesson here: <https://sshean.ca/resources/>.

when asked to do so in the survey. Most selected either Industrialization or the Great Acceleration, although there was some degree of consensus that the actual date was insignificant. Instead, most emphasized that the process of considering the start date is what provoked deeper thinking. One participant remarked, “I don’t believe there are many benefits to name one singular date. I think it’s important to see the impacts from all the moments we looked at today and understand how they lead us here.” Another participant noted that you “... run the risk of oversimplifying history by picking a specific date.” Yet one more expressed that the value in picking a date was in the development of critical thinking:

I think it can be helpful for students to choose a single date point, so they can practice using criteria...I think it also lends itself well to critical thinking and developing the ability to formulate their own thoughts, opinions using evidence to support their argument.

Most teacher candidates thought it was important to provide young people with an opportunity to examine evidence and take a position on the historical significance of different time periods.

Teacher candidates also pointed out the value in highlighting connections between the past and the present. As one participant shared:

...it can be useful to define the start of an age, especially when telling young people that it’s the age they’re a part of. It allows for them to build connections to humans from very long ago and contextualize their own lives within a historical framework.

Looking at the Anthropocene from a historical perspective was perceived as being helpful to developing a sense of connection to the causes and consequences of climate change. By situating different time periods in the past and present in relation to the Anthropocene, students may develop or enhance a sense of connection between the past and present, and consider how aspects of the world they take for granted are implicated in the climate crisis.

Teacher candidates expressed a variety of emotions throughout this lesson. “Sadness” and “Frustration” were the predominant feelings they identified, although some felt “Curious” about what they could do to change the current trajectory of climate change. “Concern” and “Fear” were also experienced. One teacher candidate remarked, “These topics always cause fear and stress within me. However, continuing to learn about it and further my knowledge brings me satisfaction.” Notably, two teacher candidates expressed “Excitement” that a historical framework was being used to discuss climate change.

After encountering the lesson, all participants had ideas of how they would adapt the lesson to use it in their future practice. Most emphasized that they would reduce the time spent on orienting students to the concept of the Anthropocene, and the historical thinking concepts’ guideposts which were described at the beginning of the lesson. This feedback is partly explained by Heather’s interest in showing teacher candidates how many concepts *could be* illuminated by this large topic, whereas with a youth audience a teacher would ideally limit the number of concepts or guideposts emphasized in setting up the lesson. Participants said they would provide more time for their students to engage with the evidence and build their cases, as would be expected with younger learners. Many considered how they would adjust the evidence packages to differently support their students’ learning, particularly those working with younger learners or those who need reading supports. Some teacher candidates indicated that they would spend more time going through examples of how to use the evidence with their students, to provide more practice as a class. One respondent also noted that they would provide their students more time to rehearse their presentations.

Overall, feedback from participants indicated that “The ‘Golden Spike’” lesson provided opportunities for deeper critical thinking about the impacts humans have had on the planet, and how that should be captured by the term “Anthropocene” according to a given periodization. One participant remarked that the lesson was “a great way to incorporate EE [Environmental Education] into a history classroom.” Teacher candidates felt more prepared to incorporate historical content and critical thinking in their own environmental education lessons. Similarly, participants felt more prepared to include these elements after

experiencing the second lesson. We will discuss their experiences after providing an overview of the lesson, *Angry Inuk* in the next section.

Lesson 2: “*Angry Inuk*”

The second lesson centers on the documentary film *Angry Inuk* by Alethea Arnaquq-Baril available from the National Film Board.⁷ Heather has been showing this film to teacher candidates since it was released, in an effort to model how a teacher might centre Inuit perspectives in teaching and learning, including exposing the complicity of geographically distant settler systems (e.g., animal rights activism and their supporters, government regulations, fashion trends) with racist discourses and associated racist environmental policies (Torrealba, 2021). The film presents the Inuit seal hunt as a culturally, ecologically, and economically sustainable and sustaining practice for Inuit communities – a perspective that stands in stark contrast to the problematic dominant narrative of the seal hunt developed by conservation organizations and animal rights activists.

As the film explores the role of seal hunting in Inuit culture, as well as Inuit expressions of anger and resistance in advocating for the rights of their communities, it becomes a powerful learning resource to explore the historical thinking concept of historical perspectives. We understand the concept of historical perspectives partly through the lens offered by Seixas and Morton (2013), which is that when inferring how people felt, thought, and acted in the past we must attend to differences in context rather than assuming sameness to ourselves. This is also particularly important when cultural differences are involved. We add to their conceptualization by bringing attention to the relevance of carefully inviting historical empathy into the process of engaging with past perspectives. We are aware of critiques of the use of historical empathy in teaching, especially the possibility that such pedagogies uphold and perpetuate the settler colonial structures and discourses that they are attempting to dismantle, if the position of “empathizer” and those who warrant “empathy” are essentialized in a fixed White settler/Indigenous binary (Zembylas, 2018a, 2018b). Considering this, two risks are outlined in the lesson slides concerning framing the task of understanding historical perspectives: overidentification (identifying oneself to an excessive degree with someone or something else, especially in cases when experiences are vastly different), and indifference (the lack of interest or concern). Students are asked to identify the emotions that arise during the lesson, including the emotions displayed by the people in the film and by themselves.

The critical thinking question associated with the lesson is “Whose perspectives on environmental policies and decisions should matter?”, conceptualized in the hope that students would connect the idea that Indigenous communities who are directly affected by policies must hold prominent voices in the policy-making process. Therefore, it is our contention that the film provides the opportunity for students to engage with Inuit perspectives and potentially develop historical empathy towards communities experiencing ecological precarity over time through forces beyond their control. In this case, precarity is intertwined with the history of colonial, Eurocentric, racist, and “animal rights” viewpoints on seal hunting, which has resulted in the ban of seal skin sales in Europe, and by extension, severely affected food security and economic development for Inuit communities. The film also features threats to human survival in the Arctic stemming from climate change (the unpredictable conditions of the ice for seal hunters, for example, is making their practices more dangerous).

For the purposes of this research, we created guided worksheets that are intended to give students a way to capture their responses to the film and scaffold towards an understanding of historical perspectives. There are two activities in the lesson. In the first activity, students use a guided worksheet to identify the most memorable moments in the film (e.g., “What stands out as a powerful moment in helping you understand Inuit perspectives?”). These moments serve as evidence from which they can make inferences about how Inuit view seal hunting, and what role it has in Inuit culture and lifeways. In the second activity,

⁷ View the film through the National Film Board: https://www.nfb.ca/film/angry_inuk/.

students are asked to compare two points in time that are featured in the film: 1983, around the time of the ban on white harp seal-pup furs, and 2009, around the time of the extended ban on all seal products by the European Union. Drawing on the historical thinking concept of continuity and change, these could be viewed as “turning points” (Seixas & Morton, 2013) in the history of the environmental policy debate. Students are asked to compare the volume of the voices of the three groups of historical actors in the situation: animal rights activists, European Union legislators, and Inuit. They use evidence from the film to determine whose voices were loudest and whose were ignored, before considering the causes of the imbalance of perspectives. For both activities, the goal is to have students draw from the cognitive acts of interpreting the evidence and drawing inferences, as well as the affective acts of responding to the emotional moments of the film, in order to better understand historical perspectives. In doing so, we sought to avoid the poles of over-identification or apathy, and land rather in a constructive form of historical empathy that bridges cognitive and affective meaning-making.

All participants in the survey following the “*Angry Inuk*” lesson indicated they had limited or no prior knowledge of seal hunting. Some reported familiarity with Indigenous perspectives on environmental issues from previous schooling, as well as through documentaries and films. Friends, family, and social media were also identified as sources of their prior learning. Regardless of prior knowledge, all teacher candidates indicated that the lesson greatly helped them recognize the value of examining a variety of perspectives. As one teacher candidate expressed:

The film did a good job at showing how people from different cultural backgrounds will have different perspectives on issues. It also showcased the difference in perspective between the people that interact with an issue in their daily lives (Inuit) vs people that interact with the issue through advertising campaigns.

This response highlights the importance of not only considering different perspectives, but also being mindful of whose perspectives are represented, especially when some groups and individuals are closer to the issue (in this case, Inuit) than others. Another teacher candidate reflected that “...it can be difficult to hear perspectives that aren’t the loudest ones.” It is clear that this participant was drawing upon their learning in the second activity and their comment points to a major consequence of imbalanced representations of environmental issues: some voices being drowned out, in both the past and the present. Overall, there was a sense that the lesson emphasized to teacher candidates that Inuit perspectives on seal hunting and the sale of seal skin products matters when learning about species management considerations. To be clear, seals are not endangered in the Canadian Arctic from hunting practices, although they are projected to be at risk due to the loss of sea ice associated with climate change.

This lesson elicited the most emotional responses of the three lessons amongst teacher candidates. “Sadness,” “Frustration,” “Shock,” and the titular “Anger” were identified as emotions and feelings experienced at various points during the lesson. One teacher candidate remarked:

I felt sad and angry for those affected by the seal hunting legislation and how the Inuit voices were not heard or blatantly ignored...I think this film also made me reflect on the harm the animal rights activists are doing to different people by not taking diverse perspectives and not listening to people directly affected.

Participants commonly connected their feelings to the need to learn from different perspectives. Another teacher candidate expressed:

It was very hard for me to watch the seals being hunted and skinned and prepared. I had to look away. But I have incredible respect for the Inuit people. I had similar feelings to them, frustration with how in Southern Canada and the US, people torture animals constantly, yet they come after the Inuit for sealing, which is their only way for survival. I felt frustrated and sad for the affected communities.

Even though this participant had difficulty watching the seals being hunted and skinned, it did not prevent them from engaging with and attempting to understand Inuit perspectives.

Teacher candidates also expressed “Joy” and “Excitement” when seeing an Inuit community come together over the seal hunt. For instance, one participant explained the power of seeing the community gather:

... just through little moments where I was able to see connections between my own experiences and family gatherings, culture etc., where I could see overlap. That really helped me to feel a sense of connection and care for that community because I was able to connect to it myself. So those little things were really beautiful moments in the film.

The film provides a complex view of Inuit culture that allowed teacher candidates to feel more connected with the lives of Inuit and develop a sense of care.

Teacher candidates identified many educational benefits of the lesson. As previously mentioned, teacher candidates frequently identified the introduction of new perspectives as a significant outcome. One teacher candidate highlighted the importance of bringing Inuit experience and expertise into conversations in the classroom. They felt that starting with the seal hunt was a good way to open the door for learning more about Indigenous knowledges and ways of knowing. Teacher candidates also expressed that considering different perspectives in the lesson could lead to students confronting their own assumptions. As one teacher candidate shared:

I think it’s important to share these different perspectives and have students confront their own beliefs. It forces students to think critically about large world organizations, and what may be happening behind closed doors that we do not see. Are the organizations we support really being transparent on what they are doing? Are they hiding information and silencing voices?

One of the purposes of the film *Angry Inuk* is to invite audience members to scrutinize the information provided to them by environmental conservation organizations, especially by examining oversimplified narratives in advertising and fundraising campaigns. Although it is not explicit in our lesson, that element of the film could be brought out through a lesson extension in which students develop a list of criteria for environmental organizations that they decide to support.

After participating in the modeled lesson, “*Angry Inuk*,” most teacher candidates had ideas about how they could adapt the lesson when teaching it themselves in the future. One teacher candidate imagined starting the class with a conversation about seal hunting to stimulate students’ initial perspectives on the issue. Another participant proposed teaching the lesson at the primary and junior levels (kindergarten to grade 6). They thought it would be appropriate to include opportunities for students to discuss aspects of the film in smaller groups first, to unpack their thoughts. Pausing the video at different intervals to engage in discussion was also suggested. Many thought the first worksheet on its own would be easier for younger students to understand and engage with, if scaffolded by the teacher.

Regardless of how they envisioned adapting the lesson to their own teaching practice, all respondents indicated that they were somewhat or more comfortable and prepared to incorporate historical content, and especially critical thinking, in their own environmental education lessons. In our pilot study, the “*Angry Inuk*” lesson elicited the most emotional responses, with many participants expressing appreciation for learning different historical perspectives on the seal hunt. There was a clear desire for teacher candidates to learn more about Indigenous perspectives on environmental issues in general, and an overall acknowledgement that Indigenous – and more specifically Inuit – voices are too often ignored. As Zembylas (2018a, 2018b) points out, there are risks to inviting empathy and care amongst predominantly White settler learning audiences, if such teaching is not also associated with an invitation to action that deconstructs coloniality (Zembylas, 2018a, 2018b). We view the lesson featured here as holding potential for that decolonial and anti-racist action-orientation, which could follow in lessons subsequent to this one (in our own work, and in the work of those who use this lesson). The lesson’s emphasis on developing critical

thinking was identified as being a significant benefit, which also emerged from lesson 3, as we discuss in more detail in the following section.

Lesson 3: “Misinformation, Past and Present”

The third lesson engages students in thinking critically about science denial in the past and present. It was inspired by a presentation at the Summer Institute for Climate Change Education, hosted by Climate Generation, in July 2020. In the presentation, scientist and cartoonist John Cook (2020) provided educators with ideas and resources for identifying and responding to misinformation in the classroom. He presented a series of cartoons featuring present-day issues including misinformation campaigns about climate change. As a group, participants worked together to determine the specific science denial techniques being used in each case. We began thinking about how this activity could be adapted to also consider misinformation campaigns in the past, demonstrating that misinformation is not new and thereby incorporating these topics into history education.

In this lesson, students begin by learning to identify a variety of science denial techniques used to promote misinformation. Students are introduced to the acronym “FLICC,” which stands for Fake experts, Logical fallacies, Impossible expectations, Cherry picking, and Conspiracy theories. Students also learn strategies for debunking misinformation, such as fact-checking and discrediting sources that are not reputable or relevant. Next, they consider the history behind two examples of science denial: the tobacco industry’s denial of the links between smoking and cancer, and the oil industry’s position of denying climate change. Students examine smoking advertisements from the 1950s that claim certain brands are “approved by doctors” and posters comparing those concerned about climate change and global warming to the “hysterical” children’s book character, Chicken Little. For the culminating activity, students listen to a climate denial song “Changing Your Mind” that maintains the climate has always changed so everyone should continue living as they always have. For each of these pieces of evidence, students are invited to apply the science denial techniques and strategies for debunking misinformation, while keeping in mind the wider historical and present-day contexts surrounding the science involved in each case. In creating the lesson, it was our intention to help teachers feel more equipped to address climate denial and that students would be better prepared to identify misinformation in different contexts.

The teacher candidates who completed the survey for this lesson had some familiarity with science denial techniques. Their feedback indicated that the lesson held many educational benefits. Participants highlighted the lesson’s helpfulness in supporting students to develop stronger critical thinking skills. One teacher candidate explained that teaching different strategies, through the use of examples of misinformation and science denial, “helps students develop the ability to identify and criticize misinformation and then to extend it to different possible contemporary contexts outside of school.” Another teacher candidate expressed that it was important for students to develop the skills “...to recognize tactics and...identify misinformation in their everyday life.” Overall, they pointed to the lesson’s strengths in developing critical thinking skills that would serve students across different contexts, when examining both historical and contemporary evidence.

Several teacher candidates identified the lesson’s deliberate scaffolding in guiding their learning of the FLICC strategy as a primary strength. Many commented on the value of using the introductory video on FLICC and working through the first example cartoon (from John Cook’s *Cranky Uncle* website) as a class. Teacher candidates commented that they found the handouts with the FLICC acronym helpful, and they referred to them throughout the lesson. They also noted that their learning was enhanced through opportunities to discuss the examples with their peers. Based on the feedback, teacher candidates found the scaffolded approach valuable, as it made the FLICC acronym more memorable and easier to apply.

Many teacher candidates commented on the value of using historical examples to practice the debunking strategies. One teacher candidate expanded on why the historical dimension helped them think differently about how misinformation is at play in the present. Reflecting on the pro-cigarette advertisements, they noted:

... with the tobacco industry, we know now how dangerous cigarettes are, but in the past we did not... But then you compare the cigarette ads to the vaping ads and how accessible vape is in the stores...and you can more directly compare it and go, “Oh, okay, well how can I judge them when I’m in this situation currently seeing these ads, and [what] will I become to people in the future when they’re looking back on vaping and the ad, will that be like me looking back on people smoking?”

Looking at examples from the past made it easier to see the incongruity between the claims about cigarettes and the reality of their negative effects on human health. It also shows that at least one participant recognized the importance of not jumping to conclusions or judging people in the past for their perceived ignorance, when we are also susceptible to misinformation campaigns in the present. To be clear, the ads were using misinformation techniques of the time, not simply reporting science which is now outdated; e.g., “Not one single case of throat irritation due to smoking – Camels!” Another teacher candidate commented that the approach was “helpful for understanding historical context and that misinformation also happened in the past.” Respondents observed that these examples from the past could be traced to present day issues, which emphasized the importance of critical thinking in the present.

Teacher candidates experienced varied emotions when learning about misinformation and science denial. “Surprise,” “Exasperation,” “Surreal,” and “Funny” were words used to express how they felt when analyzing some of the examples. Many participants mentioned experiencing humour when watching the music video for the climate change song, which reassured listeners that there was no need for worry as the climate has always been changing. The lyrics were accompanied by a catchy and uplifting tune. The music video evoked feelings of disbelief and surprise as teacher candidates initially thought it was presenting a credible message, before realizing the video was presenting misinformation about climate change.

Following the lesson, “Misinformation, Past and Present,” all participants pointed to the value of incorporating science denial techniques into their lessons. One teacher candidate explained that they could envision using the whole lesson because of its direct connection to Ontario’s curriculum expectations about science and climate change. Others considered ways of expanding the lesson. For example, one teacher candidate thought they could end the lesson by inviting their students to find examples of misinformation in their daily lives. The follow-up activity would allow the class to apply the techniques outside of the classroom. Another teacher candidate considered adapting the lesson to a primary class by making it more physically-engaging for students. They proposed using a four corners activity where students would move around the classroom to point out which strategies they thought were being employed in the different evidence examples.

While teacher candidates envisioned adapting the lesson differently to suit various teaching contexts, all reported feeling better prepared to teach these topics to their students after participating in the modeled lesson, “Misinformation, Past and Present.” The theme of preparedness for future teaching was common across feedback on all three lessons.

Suggesting Ways Forward for History Educators

History holds a unique place in educating students about climate change, as it roots our present-day interactions with the Earth in the past and invites students to consider possible, probable, and preferable futures in relation to the environment (den Heyer, 2017; Kramar & Oliveira, 2021; Stanley, 2007; Zosso, 2021). Across the three lessons, teacher candidates identified several educational benefits for K-12 teaching and learning: developing critical and historical thinking, collaboration between students, and the flexibility to adapt the lessons for different educational contexts. Through highlighting the strengths of these lessons, as articulated by teacher candidates involved in this study, we gain a better sense of how they may serve as examples to improve and build from when designing new social studies and history lessons that address the climate crisis and environmental racism (Torrealba, 2021), and those that will be viewed as enticing and encouraging by teachers.

According to teacher candidates, the most prominent educational benefit of the lessons is developing critical and historical thinking skills among students. The three lessons are focused on historical topics and

examples that engage students in thinking critically about different perspectives related to climate change and environmental issues. The activities within each lesson were carefully scaffolded to guide student engagement in critical and historical thinking processes, both individually and in groups. While these lessons were designed around the concepts of evidence, historical significance, and historical perspectives, other historical thinking concepts are also likely to lend themselves well to teaching and learning about environmental topics. In order to provide students with multiple opportunities to learn about historical perspectives on the climate crisis and develop historical thinking competencies when examining environmental issues, we issue a call for more critical thinking lessons that bridge the past, present, and future.

Teacher candidates also stressed the pedagogical benefits of student collaboration. Each of the three lessons invited conversation and engagement through student-centred approaches to learning. Students engaged with evidence and applied criteria to form a position they presented as a group in “The ‘Golden Spike’” lesson, discussed whose perspectives on environmental issues have been historically underrepresented in the “*Angry Inuk*” lesson, and worked together to identify misinformation techniques and apply debunking strategies in the “Misinformation, Past and Present” lesson. Across all lessons, teacher candidates commented on how engaging with and listening to their peers deepened their understanding of key concepts. Moving forward, educators are encouraged to design lessons that engage students in discussions, presentations, and group activities, both within and beyond the classroom, to allow opportunities for students to learn from one another and work together to address climate issues.

Another key feature of the way these lessons were designed is the flexibility to adapt them for different educational contexts (grade level, subject, region). When asked how they would adjust these lessons in their own classes, teacher candidates indicated that they would allow more time for students to engage with the lessons by extending activities across multiple class periods. They also discussed making adaptations for younger students, including breaking down the learning into smaller segments and incorporating activities that allow students to be physically active. Across their varied ideas for lesson adaptation, teacher candidates highlighted the value that teaching about climate change in social studies and history classes can have for learners of all ages. We invite educators to continue thinking of ways to design future lessons with flexibility in mind. If teaching environmental content in history and social studies is made easier for teachers, we can have greater confidence that they will be motivated to do so more often. In future research we will seek the perspectives of more experienced teachers to complement those of teacher candidates here.

There is much work to do in integrating history and climate change education. Building on the development and implementation of these three lessons, we are now connecting with social studies and history educators, both in K-12 and postsecondary, to gain a better sense of the types of resources they require to incorporate more environmental content and pedagogies into their teaching. SSHEAN will continue to develop new lessons to address these changing needs and ensure educators are well positioned to teach about climate change. We are also working with other teachers and researchers across the humanities and sciences to collaborate on lesson design to synergize our efforts in various disciplines and educational contexts. Current and future lessons will continue to be shared through our website. Researchers, practitioners, and teacher candidates are encouraged to engage with and adapt these resources to best support teaching and learning, while considering new ways to integrate environmental education into lessons. Together, we can develop the resources, tools, and approaches needed to position social studies and history as vital to addressing climate crisis.

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